modern castings

and **American Foundryman**

DECEMBER, 1955

Owned by THE MEN WHO BUY

The Flood at Eastern Malleable

The Naugatuck River was rising fast and there were 31 tons of iron in the furnace.

Red Hot Idea

Hot charcoal cover helps improve quality of copper-base alloy castings.

A Hard Look at the Industry

Do bad practices of the industry help to restrict your market for castings?

Tomorrow's Foundry

Materials, metallurgy, automation--where will they stand in the next ten years?

What Do We Know About Coke?

Cupola operators need a way to permit them to predict melting performance.

What Management Expects of Foundry Equipment

The manager of Ford foundries speaks to the builders of foundry machinery.

Saving 5 Man-Hours Per Ton

Better casting practice cuts cleaning room time, defects, in steel foundry.

The Navy's New Alloy

Thermenol — iron-aluminum-molybdenum alloy—has unusual properties.

HOW'S BUSINESS?

Special insert, "A Graphic Look at the Castings Industry," gives insight into the present status of foundries.

future meetings and exhibits

DECEMBER

1-2 . . Michigan Regional Foundry Conference, *Michigan State University, East Lansing, Mich. Sponsored by the Detroit, Saginaw Valley, Central Michigan and Western Michigan Chapters of the American Foundrymen's Society and the Michigan State University and University of Michigan Student Chapters.*

2 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

7-9 . . American Institute of Mining and Metallurgical Engineers, *Hotel William Penn, Pittsburgh. Electric Furnace Steel Conference.*

1956

JANUARY

20 . . Malleable Founders' Society, *Hotel Cleveland, Cleveland. General Society Meeting.*

23-26 . . Plant Maintenance & Engineering show, *Convention Hall, Philadelphia.*

FEBRUARY

9-10 . . Wisconsin Regional Foundry Conference, *Schroeder Hotel, Milwaukee. Sponsored by the AFS Wisconsin Chapter and the University of Wisconsin and the AFS Wisconsin Student Chapter.*

16-17 . . Southeastern Regional Foundry Conference, *Tutwiler Hotel, Birmingham, Ala. Sponsored by the Birmingham District and Tennessee Chapters and the University of Alabama Student Chapter of American Foundrymen's Society.*

24 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

27-Mar. 2 . . American Society for Testing Materials, *Statler Hotel, Buffalo. 1956 Committee Week.*

MARCH

2 . . Malleable Founders' Society, *Hotel Commodore, New York. Eastern Section Meeting.*

7-8 . . Foundry Educational Foundation, *Hotel Cleveland, Cleveland. College-Industry Conference.*

15-16 . . Steel Founders' Society of America, *Drake Hotel, Chicago. Annual Meeting.*
23 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

APRIL

12-13 . . Malleable Founders' Society, *Edgewater Beach Hotel, Chicago. Seventh Market Development Conference.*

27 . . Malleable Founders' Society, *Drake Hotel, Chicago. Western Section Meeting.*

MAY

3 . . Non-Ferrous Founders' Society, *Atlantic City, Annual Membership Meeting.*

3-9 . . American Foundrymen's Society, *Convention Hall, Atlantic City, N. J. 60th Annual Convention and Exhibit.*

11 . . Malleable Founder Society, *Hotel Commodore, New York. Eastern Section Meeting.*

JUNE

4-8 . . American Foundrymen's Society, *Chicago. Committee Week.*

5-8 . . Materials Handling Institute, *Public Auditorium, Cleveland. Materials Handling Exposition.*

6 . . American Foundrymen's Society, *Chicago. Technical Council.*

11-12 . . Malleable Founders' Society, *The Homestead, Hot Springs, Va. General Society Meeting.*

17-22 . . American Society for Testing Materials, *Chalfonte-Haddon Hall, Atlantic City, N. J. 59th Annual Meeting.*

SEPTEMBER

1-9 . . International Foundry Congress, Düsseldorf, Germany.

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 81-82.

Nodular Iron Group Started

Nodular iron casting problems will be studied by a new committee created by the Gray Iron Division, American Foundrymen's Society, at a meeting of the division's Executive, Program & Papers, and Shop Course committees held September 9 in Chicago.

Harold W. Ruf, Grede Foundries, Liberty Foundry Division, Wauwatosa, Wis., has accepted the chairmanship of the new committee. Purpose of the committee is to study engineering material referring to nodular iron and to correlate data in this field.

Four technical sessions and two shop course sessions to be held during the AFS Castings Congress were planned at the meeting. Topics being considered for papers to present at the Congress include: pig iron, European cupola practice, evaluation of foundry coke, testing foundry coke, casting tolerances, heat treatment of gray iron, upgraded irons, gating research, welding gray iron castings, paper roll materials, carbon equivalents, and a paper from Germany.

Shop course sessions will deal with cupola melting, and raw materials in gray iron melting.

Welding Committee Lays Plans

Just exactly what is meant by welding "reclamation," "repair," and "salvage" is not clear with the newly formed Joint Committee on Welding Iron Castings, but they are going to find out.

Officers of this group set up by the American Welding Society and the American Foundrymen's Society, elected to three-year terms at the first meeting are J. S. Vanick, International Nickel Co., Inc., New York, chairman; and Sidney Low, Chapman Valve Mfg. Co., Indian Orchard, Mass., vice-chairman.

Committee activities will cover Design (castings welded to each other and to other forms), Physical and Mechanical Properties (tension, shear, etc), Metallurgy (including metallography), Fabrication (techniques and procedures), and Inspection and Testing (procedures and methods).

december, 1955
vol. 28 no. 6

modern castings

and American Foundryman

in this issue

regular departments

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TIPS, TRENDS AND TECHNIQUES

What the well-dressed man wears in the cleaning room (front cover) shows one reason for Waukesha Foundry Company's good safety record (78 per cent below national foundry average).

Yankee ingenuity has pulled many a foundryman out of a hole but few have been in the spot that developed when flood waters stopped a 31-ton air furnace heat (page 36).

What you don't put in you don't have to take out is the basis for the red hot idea for copper-base melters described on page 39.

A former foundryman takes a constructively critical look at the castings industry (page 40) in an attempt to get castings producers to do better by themselves. At the same time he seeks to clear up misconceptions engineers and designers have about castings and casting processes.

"Graphic Look at the Castings Industry," this month's Bonus Section (page 45), gives a graphic comparison of production for the past 5 years, discloses how castings producers spent over $1,600,000,000 in 1953.

Will foundrymen push a button tomorrow? An observer who takes a periodic look at trends in the castings industry comments on possibilities of several decades ahead (page 53).

Present state of knowledge of coke and the need for a coke characteristics index are brought out on pages 55-56.

If you were invited to tell a group of foundry equipment manufacturers what you expected of their products today and in the future would you tell them the same things the manager of Ford foundries did (page 58)?

5 man-hours per ton is worth saving in any foundry. How one steel foundry did it through liberal use of common sense analysis of operating problems is told on pages 60–61.

Iron and aluminum combine with a little molybdenum to make an unusual new alloy. Containing no critical elements in short supply, the new alloy is already being cast by at least one foundry and is expected to find use where high strength, heat resistance, oxidation resistance, and lightness are needed (page 62).

products and processes

Air Filter Aid

Coats cloth-type Ultra-filtration dust collectors with matrix upon which fine particles and tarry matter are collected. One application lasts 2-3 years; maintenance is limited to removal and replacement of spent filter aid at these intervals. *Wheelabrator Corp.*

CIRCLE No. 1, PAGE 81-82

Quiet Tumbling Mills

Addition of 3/4" Neoprene rubber to inside of shell and quieter drive cut tumbling noise about 90%. Including dust removal provisions, mills are 24-48" diam, 9-92 cu ft. Tape recordings of noise comparisons available. *W. W. Sly Mfg. Co.*

CIRCLE No. 2, PAGE 81-82

Aerosol & Smoke Photometer

Rugged, portable unit for measurement, study, control of air pollution and particulate matter in aerosols; also rapid evaluation of filter designs, efficiencies of fans, air-wash systems, air conditioners. May be remote from recorder for control applications. Bulletin *Phoenix Precision Instrument Co.*

CIRCLE No. 3, PAGE 81-82

Height Gage

Speeds layout, measuring, inspection with scribing features of vernier height gage, quick reading figures and graduations in thousandths from 0-3" (to 9" with risers) from zero at base. Fast, accurate settings with knurled thimble. Bulletin. *Greist Mfg. Co.*

CIRCLE No. 4, PAGE 81-82

Serrated Steel Hand Stamps

"Sur-Grip" stamps have horizontal grooves on two sides to position fingers for stress-free, secure holding; to prevent stamp from slipping or flying dur-

Cold-Setting Core Binder

"Kold-Set," Swiss-developed formulation of oils, in amounts to 2% controls sand life, simplifies handling, produces accurate cores without ramming, with 50-60% less rodding, no rough cleaning, uniform surface hardness. Case histories, technical data available. *G. E. Smith, Inc.*

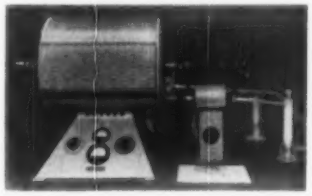
CIRCLE No. 5, PAGE 81-82

ing impact. Sturdy plastic bench box. Mushroom-preventing "Safe-Hed." *Jas. H. Matthews & Co.*

CIRCLE No. 6, PAGE 81-82

Hydrogen Determinator

Only 20 min to determine hydrogen content of most metals and alloys. Claimed accurate for concentrations as low as 10 parts per million or as high



as metal hydrides. Takes samples up to 10 gram; easy to maintain; inexpensive to operate. One model for metals igniting below 1000 C; another for those below 1400 C. No vacuum required; adaptable for carbon and sulphur. *Ledoux & Co.*

CIRCLE No. 7, PAGE 81-82

Telephone Amplifier

3-oz transistor hearing aid for telephones in noisy locations, for hard of hearing clips over any style receiver; cuts out room noise by picking up

speech by magnetic induction; shuts out disturbances from electrical circuits and appliances. No warm up; adjustable volume; dime-sized batteries last several months. *Remler Co.*

CIRCLE No. 8, PAGE 81-82

Centrifugal Fan

Backward-curved, all-aluminum airfoil blade design in the new Ilg Type BC Centrifugal Airfoil Fans produces complete freedom from air flow separation at all normal working pressures. New fans have sparkproof construction and non-overloading characteristics, meet requirements for both Class I and II

performance, permit operations up to tip speed of 13,500 fpm max. *Ilg Electric Ventilating Co.*

CIRCLE NO. 9, PAGE 81-82

Build-It-Yourself Cranes

Underhung and top-running hand geared cranes (½-5 tons); single trolley (½-1T) and multiple trolley (-2T) underhung push-type cranes,

spans to 30'. All parts except I-beam and cross-shaft (get these from local steel warehouse). One man assembles any in few hours. Use with hand or electric chain hoists. *Conco Engineering Works.*

CIRCLE NO. 10, PAGE 81-82

Folding Steel Box

180-lb pallet-type Hamlintainer with static capacity of 5000 lb assembles or folds in less than 20 sec; has no loose

parts, OD 40-3/8 x 48½ x 7-15/16" (folded) 28¾" (assembled). ID is 38¼ x 46¼ x 24½". *Hamlin Metal Products Co.*

CIRCLE NO. 11, PAGE 81-82

Pre-fab Warehouse

New straight-wall pre-fabricated steel building, featuring inexpensive trussless construction, is designed specifically to meet storage needs of metal processors. Can be erected in hours by as few as two workers using simple hand tools. Walls rise vertically 9 ft before curving to form a semi-circular roof. Interior is completely free from supports, pillars, beams, or posts.

CIRCLE NO. 129, PAGE 81-82

Buildings are 30-50 ft wide, 12-18 ft high, and as long as required. *Wonder Building Corp. of America.*

CIRCLE No. 12, PAGE 81-82

Tractor Shovel

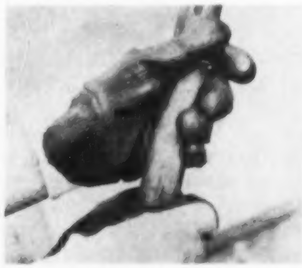
Two wheel drive, rear-wheel power steering, high lift of 7'9", 3/4 yd struck capacity, bucket breakout of 40° tip-

back, hydraulic and mechanical brakes, forward speeds to 14 mph,--reverse to 23. *Frank G. Hough Co.*

CIRCLE No. 13, PAGE 81-82

Palm-Coated Jersey Gloves

Stanflex work glove with 47+ sq in. of seam-free surface of specially-com-

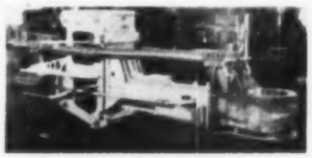


pounded plastic coating has non-slip satin finish, outwears leather; also in 10" band top style. *Pioneer Rubber Co.*

CIRCLE No. 14, PAGE 81-82

Furnace Electrode Holder

Adjustable crosshead rollers assure positive alignment against mast and smooth operation. Heavy cast steel arm requires no water cooling. Electrode



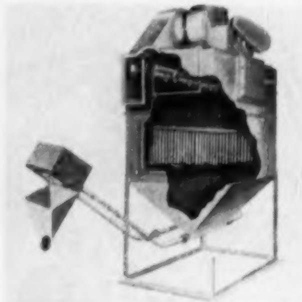
holder is shielded from heat and flames. Adequate support for conductors eliminates auxiliary support for flexible cables. Bulletin. *Swindell-Dressler Corp.*

CIRCLE No. 15, PAGE 81-82

CIRCLE No. 103, PAGE 81-82

Gas Scrubber

Type A Hydro Precipitator Scrubber removes microscopic solids, fumes, odors by hydro-compressing exhaust gases through tube system into water chamber. No moving parts, self-cleaning, recirculating water, automatic

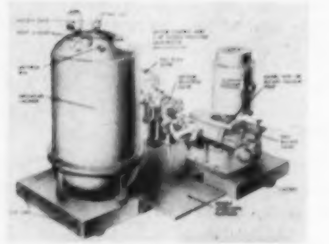


makeup; 15 sizes—500-40,000 cfm; indoors or out; constant or intermittent sludge removal—manual, hydraulic, chanical. *Johnson-March Corp.*

Circle No. 16, page 81-82

Mobile Degasser

Accommodates crucibles up to #400 Type A or #3600 Type B; eliminates gas or chemical flushing, improves



physicals, allows use of lower grade secondary metals, makes impregnation unnecessary. *Kinney Mfg. Div., New York Air Brake Co.*

Circle No. 17, page 81-82

Box Rotor Feeding Stand

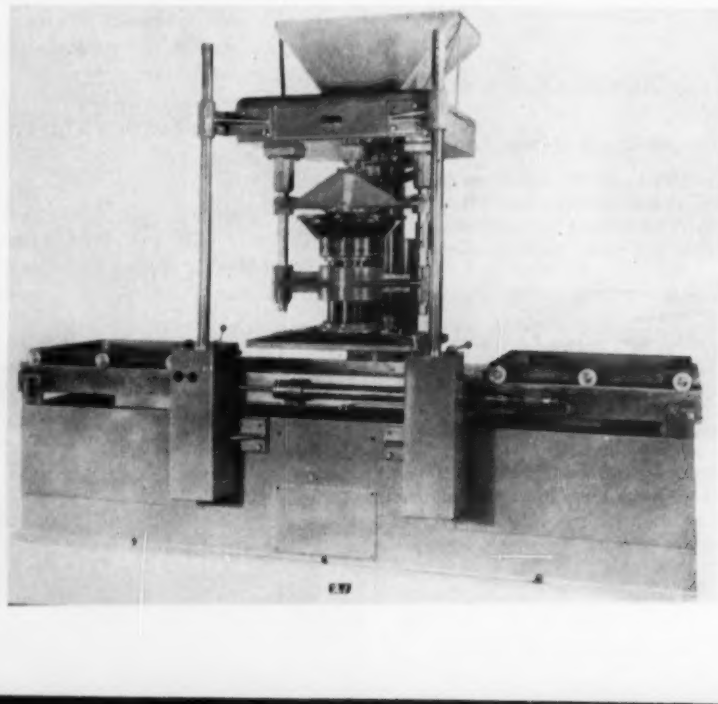
A low-speed gear operated box rotor with feeding stand for dumping any size container has been announced. Dumping is accomplished by a manually operated set of gears which tilts the box and empties small parts or other material into the feeding stand tray for easy disposal by standing or sitting workmen. Boxes of any type construction can be handled. Rotor and stand are of heavy duty all steel reinforced construction, and are built to customer specifications. *Palmer-Shile Co.*

Circle No. 18, page 81-82

Shell Molding Machine

Semi— or fully automatic Cor-Blo completely cures inside and out of shells blown into closed, heated molds that control thickness and surface contour. Internal electric elements heat pattern and contour plates. Operator removes finished shell while machine blows and opens other mold. 3/16" production shell is being made on a 15 sec automatic cycle. Series 800 makes shells up to 22 x 30 x 6" or 36 lb; has 40 lb sand tube and 450 lb sand hopper. Series 500 receives 250 lb sand, holds 16, makes max shell of 12 x 20 x 4" or 14 lb. *Harrison Machine Co.*

Circle No. 19, page 81-82



Bench Core Blower

All operations of push-button CB5C Flexiblo are automatically sequenced,

error impossible; handles open-face, horizontally-split, vertically-split core boxes; complete package no extras. *Beardsley & Piper Div., Pettibone Mulliken Corp.*

CIRCLE NO. 20, PAGE 81-82

Gravity Casting Machine

New automatic gravity casting machine, called Grav-O-Matic, eliminates large inventories often necessary when using outside foundries as the source of permanent mold castings. Automatic metal temperature control, pouring control and casting cycle eliminate production variations usually traced to the human element. *Automation-Engineering Corp.*

CIRCLE NO. 21, PAGE 81-82

Snow Plow Attachment

50" angling blade, easily installed on Prime-Mover ¾-ton powered wheelbarrow, provides quick, easy snow re-

moval. 10 cu ft bucket holds ballast or sand for spreading on icy walks and drives. *Prime-Mover Co.*

CIRCLE NO. 22, PAGE 81-82

Stationary Air Compressor Line

New line of two-stage, air-cooled air compressors has displacements of 260, 415, and 550 cfm at 125 psi, and take electric motors of 50, 70, and 100 hp. Claim new 3-cylinder 5082 and 6-cylinder 7582 and 10082 compressors

continued on page 12

Skin Disease Is Costly Enemy Of Industry And Workers

It doesn't pay to be thick-headed about our own thin skins. Experts now find that skin disease costs industry more in lost time and compensation payments than all other occupational diseases combined. The cost to industry of the average industrial worker hit with a skin disease is: 10 weeks off the job; $100 in compensation payments; and $90 for medical care.

To avoid these losses, a plant should have three goals: keep the plant clean, encourage the worker to keep himself clean, and keep the worker protected from irritants causing skin disease.

A clean plant means good housekeeping. Good industrial housekeeping reaches into many corners and includes plant design and ventilation.

A worker's personal cleanliness is the keystone of any program for preventing skin disease in industry. Personal hygiene will provide for quick removal from the skin of any irritants unavoidably contacted.

Protection for the worker includes the use of protective clothing and vanishing, water-repellent or solvent-repellent ointments and creams, and special lotions to prevent excessive drying and chapping of the skin.

Combating skin disease in industry is the subject of a recently published booklet by Dr. Louis Schwartz. Free sample copies of the booklet may be obtained from the Cleanliness Bureau, Association of American Soap & Glycerine Producers, Inc., 295 Madison Avenue, New York 17, N.Y.

Learn Plant Safety at Home

A new home study course in industrial safety engineering has been added to the curriculum of International Correspondence Schools, Scranton, Pa.

The course, comprised of 41 lessons requiring an estimated average study time of 650 hours, provides instruction in mathematics, machine sketching, blueprint reading, industrial psychology, handling of materials, plant and production equipment layout, and safety principles and practices.

Report Racket Reduction

Costs and problems resulting from workers who suffer loss of hearing through work in the metal castings industry and practical noise reduction and hearing conservation programs will be discussed in a noise symposium that will appear in the January issue of MODERN CASTINGS.

All of the information used in the symposium will be taken from material developed by the Noise Control Committee, 10-M-e, of American Foundrymen's Society. This group is now preparing a manual on foundry noise that is intended to provide basic information on the need for hearing conservation programs with guides for establishing medical and engineering controls.

Decision to release the committee's information for publication in the magazine was reached at a meeting of the committee held October 4 in Chicago.

At this time the committee also listed the following papers for presentation at the AFS Castings Congress in May: *"Legislative Trends Affecting Hearing Loss Compensation," "What Noise Does to Hearing," "Typical Noise Exposures in Foundries," "Control of Noise—A Demonstration,"* and *"Short Case Histories of Noise Control."*

Erie School To Have Foundry

School days at the Memorial Technical High School now being built in Erie, Pa., will find the ABC's lightly sprinkled with foundry sand. Erie public school students have not had a chance to try their hands at metal casting before, but the new \$2.25 million school will include a foundry lab.

Leader of the move to include a foundry in the school was Earl M Strick, Erie Malleable Iron Co., long active in castings industry educational programs. In recognition of his educational work, Mr. Strick was made an Honorary Life Member of the American Foundrymen's Society in 1954.

CIRCLE No. 106, PAGE 81-82

continued from page 9

have balanced design which reduces vibration and noise to a minimum and are ideal where compactness, light weight, and minimum attention are required. *LeRoi Div.*

CIRCLE NO. 23, PAGE 81-82

Vacuum Degassing Chamber

Model 400 processes up to 1000 lb metal in ladle or crucible at pressures below 200 microns; 1/5th the time to

de-gas aluminum with dry nitrogen. Movable; larger sizes available. *Centrifugal Casting Machine Co.*

CIRCLE NO. 24, PAGE 81-82

New Drafting Desk

Draft-A-Matic makes possible all drafting operations from a seated position. Drawing surface is a 48" wide vinyl plastic belt on rollers at front and back of platform. Belt and work affixed to it are moved by turning front roller. Reduces fatigue, time-outs, low morale; allows use of posture chair. *General Fireproofing Co.*

CIRCLE NO. 25, PAGE 81-82

Graphite-Base Core Wash

Stevens Graph-Kote, graphite base foundry core coating, is designed for use wherever a "short" wash is desired. Since there are no run-downs or build-up cores can be dipped faster, conveyors and racks are cleaner, and core

cleaning is minimized. Eliminates the white film frequently found on iron castings when a carbon-free coating is used. Recommended for gray iron, copper-base and special alloys. *Frederic B. Stevens, Inc.*

CIRCLE NO. 26, PAGE 81-82

talk of the industry

LOOKING AHEAD? Here's what you'll see in the way of frontiers in the castings industry according to R. W. deWeese, VP-sales, Electric Steel Foundry Co., speaking at the recent Northwest Regional Foundry Conference: (1) Scientific design of gating and feeding; (2) Further advances in shell molding; (3) Specific engineering design data for individual alloys; (4) Development of new alloys for high temperatures, high pressures, and corrosion; (5) Vacuum melting; (6) Further advance of automation within the industry; (7) Higher standards in hygiene, safety, and air pollution; (8) Aggressive product development; (9) Casting of titanium; and (10) Carbon dioxide hardening of cores and molds.

DETACHED PADDING you might call it. Promoting casting soundness through controlled directional solidification is an established principle and foundrymen use risers, padding, chills, even mold materials of varying thermal conductivity to get what the customer is after. Investment casters have come up with "heater" sections. Described by Walter Sulzer, manager, Sulzer Bros., Winterthur, Switzerland, in a paper read at the annual meeting of the Investment Casting Institute, heater sections are wedge-shaped gated cavities dispersed in the cluster of casting cavities in such a way as to provide heat reservoirs near sections that should freeze last.

HOW GOOD are your medical services? Occupational Health Institute, 6 East 39th St., New York 16, will check your program and medical unit at no charge to see that you're keeping up with advances in the field. Certificates of Health Maintenance are issued to plants which comply with Industrial Medical Association standards. Among 248 officially accredited medical programs in the United States, Canada, and Hawaii are American Brake Shoe Co., Baldwin-Lima-Hamilton Corp., American Smelting & Refining Co., and a number of other metal producing and working plants.

LIKE OTHER FOUNDRYMEN we've described the operation of a core oven to the uninitiated as something very much like the housewife's baking oven with accurate temperature control and timing being just as important. Core mixtures are carefully compounded and, after baking at about the same temperature as you'd bake a cake, many cores come out a golden brown that would do justice to a burnt sugar cake, we'd say. We got to thinking about this the other day when George Edwards, president, Woodruff & Edwards, Inc., told us how handy their vertical oven is for baking potatoes and hams (just wrap in aluminum foil and put on a core plate). Hams may have to be re-cycled depending on time and temperature you operate at. We know of at least one instance in which a range oven actually was used for baking cores. Leo Brom, partner and

Australian Foundrymen Hold Annual Meeting and Exhibit

Australian foundrymen recently held a convention and exhibition in Sydney that drew visitors from as far as New Zealand, a 1600 mile ocean flight from Sydney.

The attraction was the second convention and exhibition of the New South Wales Division of the Institute of Australian Foundrymen. Consulting engineer William A. Gibson of Sydney reports that both conveniton and exhibition were well attended.

Twenty firms were represented in the exhibition held in Sydney's town hall. Most of the exhibits were operating.

Sand problems, shell molding, and centrifugal casting drew most of the attention in the six papers presented to the convention. The American Foundryman's Society exchange paper, *"Sand Control for the Average Jobbing Ferrous and Non-Ferrous Foundry,"* was presented by E. C. Zirzow, Werner G. Smith Inc., Cleveland.

Tours of two plants in Sydney were included in the convention program. Plants visited were Babcock & Wilcox Pty. Ltd. and Australian Aluminum Co.

How to Cast Better 220 Al

Sand-cast 220 aluminum-base alloys, reported to have better mechanical properties than commercially available 220 alloy, have been produced by a process described in a report of Army-sponsored research just made available by the Department of Commerce.

In studies conducted for Frankford Arsenal, Battelle Memorial Institute has developed a procedure for producing and heat treating basic 220 composition to minimize brittleness and other unfavorable characteristics of the alloy, while retaining its strength, ductility, corrosion resistance and machinability.

Details of experimental procedure, with charts and illustrations, are available in bulletin PB 111699, Development of Sand-Cast, Aluminum-Base Alloys Having Improved Properties. Order from Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C., price $2.00.

metallurgist, Brom Machine & Foundry Co., remembers as a child how his father started the company from scratch, using the kitchen oven until the foundry had a regular core oven. And while we're reminiscing, there's the time a core maker came to work in a Minneapolis foundry with a doughnut in his lunch. One of the boys ate the doughnut, then made a substitute of core sand, baked it, dusted it with parting compound, and wrapped it in the waxed paper his friend's doughnut had been in. Came lunch and the trick fell through because the core maker wasn't hungry enough to unwrap the "doughnut." It clicked that evening when his wife opened the lunch box and decided to eat the doughnut he had left. She still blames her husband for the mouthful of sand.

GET IN TUNE with the times and stay there or you won't keep up with customer demands Tom Curry, research director, Lynchburg Foundry Co., warned at the Ohio Regional Foundry Conference. He listed his company's technical and development program under four headings: (1) Improved manufacturing control of the present product; (2) Development work to improve product quality; (3) Extending the use of the product; (4) Improved end use of the product. The product, of course, is metal castings.

SMOOTH CASTINGS look better, have better characteristics where fluid flow is involved, plate and paint better. While maximum smoothness is not always possible because of permeability problems, the trend for some years has been toward finer grain size in mold materials. Some green sand foundrymen have developed their practice so highly their customers think they are buying shell mold castings. For others who want to follow suit, there's strict sand and molding control, or a new waterless binder we're told is coming up soon. Gray iron castings we saw the other day were poured in molds side by side. One casting was made in a regular production mold with a permeability of 70; it had a surface to match. The other was poured in a mold bonded with the new material. Permeability was 12 and casting surface was so smooth we insisted the metal had been poured cold. Pouring temperature was 2900 F we were told.

STEEL FOUNDRIES in Oregon and Washington face serious interruption of business or must import scrap from other areas if loss of large export tonnages continues according to O. K. Buckner, works manager, Electric Steel Foundry Co. Newspaper ads encourage scouring the northwest part of the U.S. for scrap to fill export commitments. Foundrymen find it impossible to buy scrap at any price. The National Castings Council is already on record with the Government, as are the trade associations, regarding the need for control of scrap export.

CORE SHOOTING has entered foundry terminology by way of Germany where some cores are "shot" instead of blown. Equipment used is based on a new principle. Only a small amount of compressed air expands in the sand hopper or magazine. The air is applied in a sudden shot, accelerating the sand so that it fills the core box "completely and uniformly." Advantages claimed include: vibrating unnecessary; minimum air consumption; shoots any mixture; uses wood boxes, wear on metal boxes almost immeasurable; core box not under line pressure; in many instances use of core driers is eliminated as is necessity to bake (evidently refers to CO_2 process).

Herbert F. Scobie

"One unit pays for the next"

KEEN FOUNDRY COMPANY reorders

Handy Sandys 3 TIMES

Mr. Lou Keen, President of Keen Foundry Co., Griffith, Indiana, states: "We've invested in ten Newaygo Handy Sandys in less than 3 years for several reasons. First, these individual Sand Handling Units are very adaptable to the physical characteristics of our foundry. Second, their great flexibility gives us overhead sand stations at any point in the foundry without costly remodeling. Third, Handy Sandys require low capital investment."

"Naturally, the proof of the equipment's value to us is its performance. Since installation we have, in one section of our foundry, conservatively increased mold output by over 25%. In another section, in conjunction with a change in molding procedures, we are still maintaining the same mold production over a six hour period, but we are getting twice as many castings per mold."

"We also figure the molder's fatigue factor has been decreased by 50%. Before Handy Sandys the average molder shoveled about 15 tons of sand per day; now he uses the shovel for occasional cleaning up around the molding machine."

Keen Foundry Co., a grey iron production operation, manufactures castings for electric hoists, gas pumps, engines, pressure valves, air compressors, machine tools and other industries. Castings weigh from 5 lbs. up to 100 lbs. each, and the flasks used with the Handy Sandys vary from 18" x 18" to 24" x 30".

Three of these Newaygo units operate in conjunction with Osborne Rotolifts averaging about 120 molds per unit in a 6 hour period. On this job each mold has 8 castings and 4 cores. Molds are set out by molder using overhead crane hoist.

The lower sand bins and boot of elevators are sunk 3 feet into the floor almost tripling the sand capacity of each Handy Sandy Unit.

Showing two Handy Sandys over squeezer work. These units produce over 140 molds each in a six hour period. Molds are set out by operators who also handle pour off.

Sand bins on all ten units are supplied from a central sand system by a Payloader.

NEWAYGO engineering company
NEWAYGO, MICHIGAN

CIRCLE No. 109, PAGE 81-82

Chicago Gray Iron Founders Report Business Good

Quarterly meeting of the Chicago Management Group of the Gray Iron Founders' Society featured an inspection of production facilities and methods at Hansell-Elcock Co., September 22, and a luncheon meeting at the Graemere Hotel. J. M. Gajentan, Jr., Chicago Foundry Co., president of the group, presided at the luncheon session.

The new GIFS field director, E. Harold Mitchell, outlined the society's merchandising and promotion plans. R. T. Lewis, Keene Foundry Co., Griffith, Ind., retiring 8th district director of the organization discussed GIFS operations.

Roundup of opinion on business conditions indicated that prospects for the latter part of 1955 were good with operating rate of some 85 per cent of maximum commercial demand. Backlogs ranged up to six months; most shops were operating 40 or more hours per week.

Release Ductile Iron Film

The first motion picture film on the properties and applications of ductile cast iron has been released by International Nickel Co., Inc., New York.

The film graphically illustrates the fact that the new engineering material which can be cast like gray iron has properties similar to steel. The ductility of the iron is illustrated by bending, twisting, impact, and tensile tests.

A 15-minute sound, color film, *"Ductile Cast Iron"* incorporates five years of production experience and use of this material. Among the illustrated applications are gears, pinions, plow shares, pistons, and pneumatic couplings.

More information regarding the film may be obtained by writing Nickel Information Service, International Nickel Co., Inc., 67 Wall Street, New York 5.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 81-82. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

No-Foreman Program Lifts Morale, Boosts Efficiency

Increased morale has spread throughout the entire plant of International Steel Co., Evansville, Ind., ever since a unique company program of upgrading foremen to department manager status was set up.

In an address entitled *"We Have No Foremen,"* Walter G. Koch, president of the company explained at a meeting of the National Metal Trades Association how a test program of changing over 75 foremen to managers is having such beneficial results that it will be continued and expanded.

The project, initiated about one year ago, has brought an entirely new concept towards the foreman—traditionally neither labor nor management. Under International Steel's program, the foreman, now known as department manager, is part of management's staff and participates in management conferences and semi-monthly information meetings. He also undertakes work simplification and job analysis studies.

Educational training, including classes at the local college at company expense on applied economics, the functions and problems of management, and a class on word meaning and pronunciation is accorded all foremen.

Note Big Change

The most noticeable change in the foreman-to-department-manager policy has been in the physical appearance of the man. He is encouraged to wear business suits, or just sport shirts and trousers, foregoing the usual factory work clothes. He also has his own office on the factory floor with a desk and telephone.

"Make your foreman manager of his department but at the same time, make him an active member of the management team, with responsibility, authority and accountability commensurate with his job. Train, develop, motivate and evaluate his progress—those are the basic factors which determine the success of a program designed to strengthen your frontline management" Koch stressed in his speech.

let's get personal

Dr. Paavo Asanti . . now touring U.S. foundries as part of International Education Exchange Program of the Department of State. Dr. Asanti, researcher and professor of metallurgy at State Institute for Technical Research, Helsinki, Finland, visited Foundry Technical Center of the American Foundrymen's Society to encourage foundrymen to visit Finland as part of next International Foundry Congress. Finland, he stated, has the world's largest low frequency induction furnace melting gray iron.

Goff Smith . . elected to presidency of Griffin Wheel Co., Chicago, subsidiary of American Steel Foundries. Mr. Smith succeeds **Edmund Q. Sylvester** who resigned to establish a wheel business in South Africa.

Robert J. Gleffe . . appointed salaried personnel director of Central Foundry Div., GMC, Saginaw, Mich.

Dr.-Ing. W. Patterson . . pupil and collaborator of Professor Dr.-Ing. E. Piwowarski named to chair of the foundry faculty at Aachen Technological Institute vacant since Piwowarski's death two years ago. Patterson, author of over 40 papers on metal castings, has been prominent in both academic and industrial phases of German metal castings activity.

Arthur P. Siewert . . made superintendent of gray iron foundry department at Danville, Ill., Central Foundry Div. plant of General Motors.

Ralph Anderson . . replaces Arthur Siewert as plant metallurgist at Central Foundry's Danville, Ill. plant.

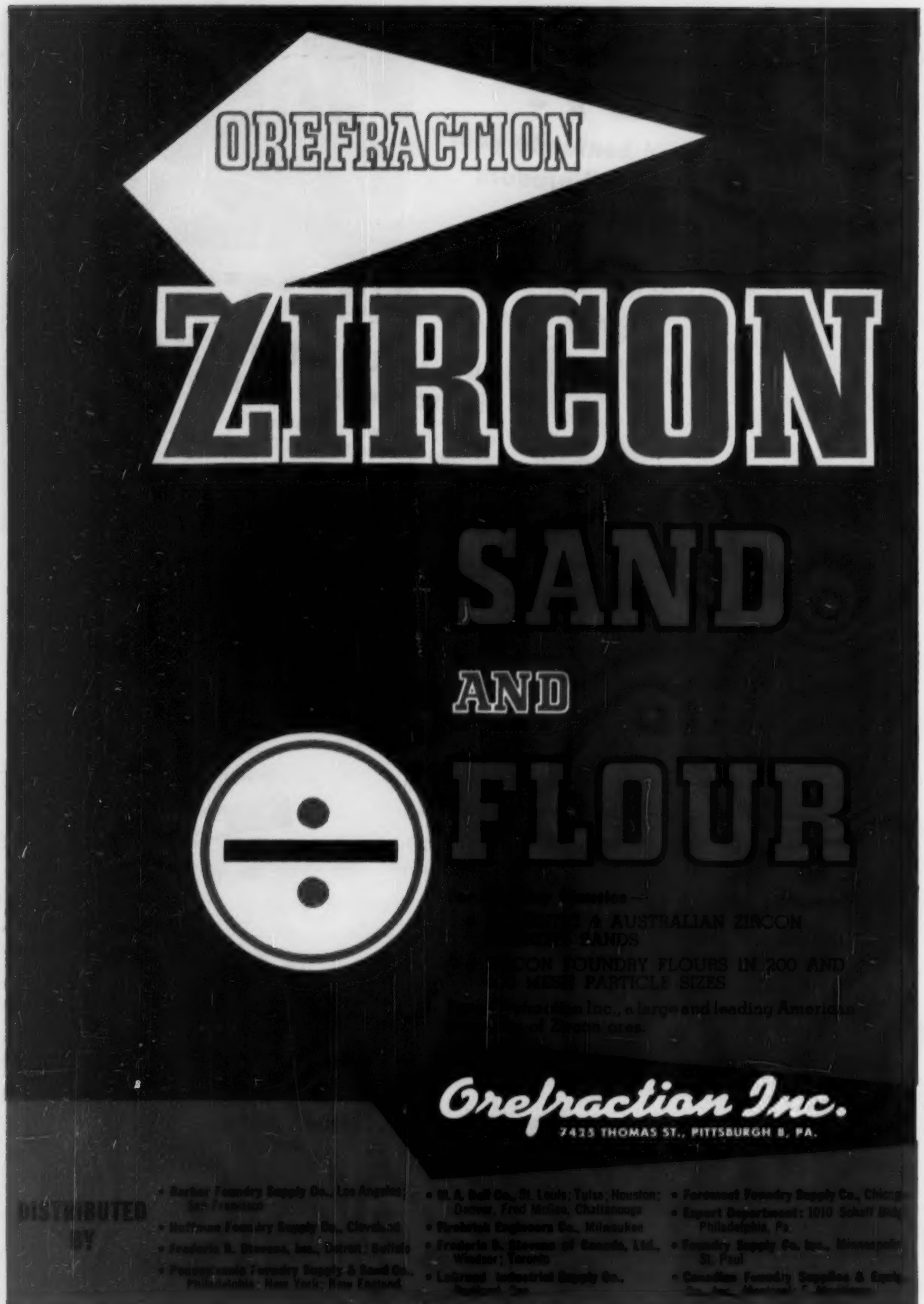
Morris A. Scott . . retired from Greenlee Foundry Co. with William J. Willmot named foundry manager and L. B. Harkrider named sales manager to replace Mr. Scott.

C. Eugene Silver . . appointed sales representative for complete line of molding machines of Herman Pneumatic Machine Co. Silver's office is in Houston and his territory includes Texas, Louisiana, and Oklahoma.

Goff Smith

Robert J. Gleffe

C. Eugene Silver



Dale Wonus . . promoted to superintendent of malleable shell department, Danville, Ill. plant. Central Foundry Division of General Motors.

Anthony J. Derrick . . now manager of foundry department of Kennedy-Van Saun Mfg. & Eng. Corp.,

Anthony J. Derrick

Danville, Pa., will be in charge of production and sales.

Joe Joseph . . now general foreman in new core department at Defiance plant of Central Foundry Div.

Anton Dorfmueller, Jr. . . appointed sales representative for Archer-Daniels-Midland Foundry

Anton Dorfmueller, Jr.

Products Div. in Buffalo, N. Y. territory. He replaces **A. S. Coulter** who will retire.

Federated Metals Div., American Smelting and Refining Co., shifts key personnel with following changes: **George M Baumann**, assistant general manager of midwestern department, transferred to New York as assistant to **Frederick**

Walker. **James F. McQuillan** moves from Houston, Texas plant to replace Baumann while **M. Robert Herman** moves up to manager of the Houston operation.

James L. Yates . . named district manager of midwest territory by National Engineering Co., Chicago.

James L. Yates

Clarence E. Bullinger . . retires as professor and head of department of industrial engineering at Pennsylvania State University with emeritus rank. Bullinger now becomes educational adviser in industrial and mechancal engineering at Taiwan Engineering College, Tainan, Formosa.

John Wolfe

John Wolfe . . named vice-president in charge of sales, Pioneer Foundry Co., Jackson, Mich.

Selas Corporation of American announces the following sales organization changes: **William M. Smith** moves to home office and **William C. Schneider** replaces him in New York City—North Jersey area. **Kenneth E. Rasmussen** replaces Schnei-

der in Rochester, N. Y. area. **Harry E. Morton** becomes sales representative in Chicago district.

Herbert H. Schroeder, Jr. and Forrest W. Buck, Jr. . . new positions with Lithium Corp. of America, Minneapolis. Schroeder is now coordinator in new product research and development department and Buck is sales representative for Pennsylvania, Ohio, West Virginia, Virginia, and New York.

C. Don Hicks

C. Don Hicks . . appointed vice-president of Michiana Products Corp., Michigan City, Ind.

Arthur J. Karam . . named superintendent of newly created core department at Defiance, Ohio plant of General Motor's Central Foundry Div.

E. M. Uebel and K. H. Kirgin . . join ductile iron section of International Nickel Co.'s development and research division, Bayonne, N. J.

John P. Borda and Edward M. Van Winkle . Borda appointed general manager of Magnus Metal Div., National Lead Co., and Van Winkle becomes president of Magnus Metal Corp., a subsidiary. Both jobs were held by **William V. Burley** who has retired.

Ralph D. Brizzolara . . vice-president of American Steel Foundries named director of Griffin Wheel Co.

Lazarus Chapman and Howard K. Chapman . . Lazarus Chapman elected board chairman of H. Kramer & Co. with Howard K. Chap-

man replacing him as president. Company operates plants in Chicago, Philadelphia and Los Angeles.

E. W. Baumgardner . . announced as sales manager of Trabon Engineering Corp., Cleveland.

Ivan E. Howard . . now district manager of Cleveland office, Lamson Mobilift Corp.

W. M. Champion . . district manager of Air Reduction Sales Co.'s Shreveport, La., sales office.

Frank Adamek, 42 years with Allyne-Ryan Foundry Co. and 26 years a supervisor, has retired. At Frank's right is F. L. Feltes, chairman of the board and president of Allyne-Ryan Foundry Co.

Robert L. Dietz . . named district manager Claud S. Gordon Co. His headquarters will be in Cincinnati.

Jack C. Thomas . . appointed district representative for northern Ohio by W. W. Sly Mfg. Co., Cleveland.

A. J. Zocalli . . named sales engineer for H. W. Leighton Co., Peninsular grinding wheel distributors in Chicago.

Refractory sales staff of Basic Refractories, Inc. has been reorganized. Changes are: **T. P. Stanton** to midwest district sales manager with headquarters in Gary, Ind. **Thomas R. Lally** replaces Stanton in Philadelphia and **T. D. Pence** moves to Pittsburgh to replace Lally. **C. A. Greenlee** moves to central sales district.

Harold E. Schlenker and John W. Vanek . . now vice-presidents of Accurate Die Casting Co., Cleve-

land. Schlenker heads sales and customer relations activities while Vanek is in charge of engineering.

Benjamin S. Head . . promoted to superintendent of finishing department, Defiance, Ohio plant of Central Foundry Div., GMC.

Dr. L. F. Mondolfo . . promoted to director of department of metallurgical engineering, Illinois Institute of Technology, Chicago.

Shaochi Huang and L. F. Spencer . . named research metallurgists at Allis-Chalmers Mfg. Co., Milwaukee.

Virgil B. Bullen . . named engineering representative for TOCCO division Ohio Crankshaft Co., Cleveland, Ohio. He will be headquartered in Chicago.

Erwin J. Campbell . . gets newly created post of supervisor of process research in research and development department, Acheson Colloids Co., Port Huron, Mich.

Donald V. Sarbach . . appointed to newly created position of research director of Hewitt-Robins, Inc., Stamford, Conn.

John Newitt . . named general manager of Kinetics Corp., Hingham, Mass.

Branch M. McNeely, Jr. . . joins Texas technical field section, development and research division International Nickel Co., Inc., Houston, Texas.

Howard Pearch . . appointed chief ceramic engineer, Louthan Mfg. Co., East Liverpool, Ohio.

Robert H. Johnson and Raymond B. Goodale . . Johnson moves to Florida sales territory and Goodale replaces him in eastern Iowa district for Norton Co., Worcester, Mass.

Birny Mason, Jr. . . named secretary of Union Carbide & Carbon Corp.

Vincent V. Tivy . . appointed chief application engineer for Foxboro Co., Foxboro, Mass.

Electric Furnace Film Out

The title of National Carbide Co.'s new 16-mm sound-color film, *"Fiery Magic,"* refers to the blazing electric furnaces where coke and lime are combined to form calcium carbide. Consecutive steps in the manufacture of carbide are clearly demonstrated by an animated flow chart, while the colorful sights of the process are reproduced on footage shot at various National Carbide plants.

Varied uses of acetylene are portrayed in the film, from its early use in lamps, through the rise of oxy-acetylene welding and cutting, and finally as an important base in mdoern chemical processes. *"Fiery Magic"* may be borrowed for showing from district offices of the Air Reduction Sales Co., National Carbide outlets or directly from National Carbide Co., 60 East 42nd St., New York 17, N. Y.

Develop Ni Saving Alloy

A material has been developed to operate in the 1200 to 1600 F range, substituting for alloys containing substantially greater amounts of nickel and chromium.

The new HF grade alloy, result of nickel conservation research at Battelle Memorial Institute sponsored by the Alloy Casting Institute, was disclosed recently in a paper, *"An Investigation of the 21% Chromium-10% Nickel Heat Resistant Casting Alloy,"* by A. M. Hall, R. J. Mangone, and D. D. Burgan.

You from Mars, too, Bub?

Buy Foundry Safety by Phone

A safety program with a new twist has been developed at Amsco Oakland Div. of American Brake Shoe Co. This unique program, in the form of a contest, has created much interest among employees and their families.

Each week a safety slogan is posted on the plant bulletin board. Then, ten names are chosen by lottery from the list of folks working at the plant, and telephone calls are made to their homes, in the order chosen by the lottery. If the person called quotes the slogan word for word, he or she wins $5. If no one should win, the prize is held over for the following week, although this has yet to happen.

"—Another one of those days when everything goes right!"

Offer Shell Mold Film

Shell molding is the subject of a new motion picture available from Link-Belt Co., Chicago, makers of new, fully integrated shell molding systems for the foundry industry.

The film runs for 15 minutes, is in color and has sound. It fully describes the Link-Belt system, a four-station shell molding machine, and the related conveying equipment to handle sand and resin, a four-station shell closing machine, and the conveying equipment.

The film is available, without charge. Write to Link-Belt Co., Dept. PR, 307 N. Michigan Ave., Chicago 1, Ill.

THE MOST WIDELY USED COREBLOWER IN THE WORLD HAS BEEN

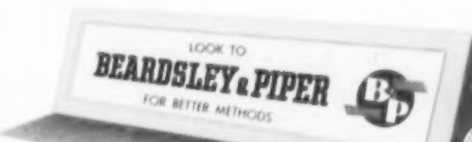
completely redesigned

the new CB5C FLEXIBLO

Here's welcome news for foundry operators interested in cutting costs — (and who isn't these days?). The CB5 — for years the most widely used machine in the small coreblower field — has been completely redesigned. The new CB5C brings you important cost *cutting* features never before available in a small blower.

- ✔ Handles all types of boxes and all types of jobs. (The CB5CD even incorporates a full two inch draw cylinder.)
- ✔ Operation is completely automatic and actuated by push button.
- ✔ Clamping, blowing, unclamping etc. are automatically sequenced — top speed with no chance of error.
- ✔ New design blow valve assures perfect cores — cycle after cycle.
- ✔ An automatically-operated removable table clamp for handling vertically-split boxes.
- ✔ Quick-change blow plate and quick height adjustment.

These are but a few of the new features — write now for complete information — Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.



FEMA

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

new books

The Automatic Factory . . Stephen A. June et al. vii + 81 pp. Instruments Publishing Co., 845 Ridge Ave., Pittsburgh 12, Pa. 1955. $1.50.

Results of a six-month research project by a student team from Harvard Graduate School of Business Administration. In attempting to answer the questions, "What is, and what can we expect from The Automatic Factory?" the men contacted numerous authorities throughout the country.

Chapters consider mechanization vs. the automatic factory, obstacles, costs, social implications, etc. Project Tinkertoy is also covered thoroughly. Appendix includes terms and bibliography.

Text-Book of Metallurgy . . A. R. Bailey. viii + 560 pp. 401 fig. St. Martin's Press, Inc., 103 Park Ave., New York 17, N.Y. 1954, $8.00.

Written to provide a modern and thorough intoduction to physical and process metallurgy. First six chapters deal with nature, structure and properties of metals and alloys, and metallography, followed by chapters on ores and their preparation, manufacture of ingots and comparison of castings production, mechanical and non-destructive testing, and metallurgical pyrometry. A comprehensive list of additional reading is given at the end of each chapter.

Forge and Foundry . . S. A. Ellacott iv + 76 pp. 79 illus. Methuen & Co., Ltd., 36 Essex St., London W.C.2, England. 1955 8s.6d

Traces casting and forging of metals, particularly iron, from Bronze Age to the present with particular emphasis on inventions rather than craftsmanship. Select list of references.

A Review of the Air Force Materials Research and Development Program, PB111153 . . Louise M. Kocker. vi + 138 pp. U. S. Department of Commerce, Office of Technical Services, Washington 25, D.C. 1954. $3.75.

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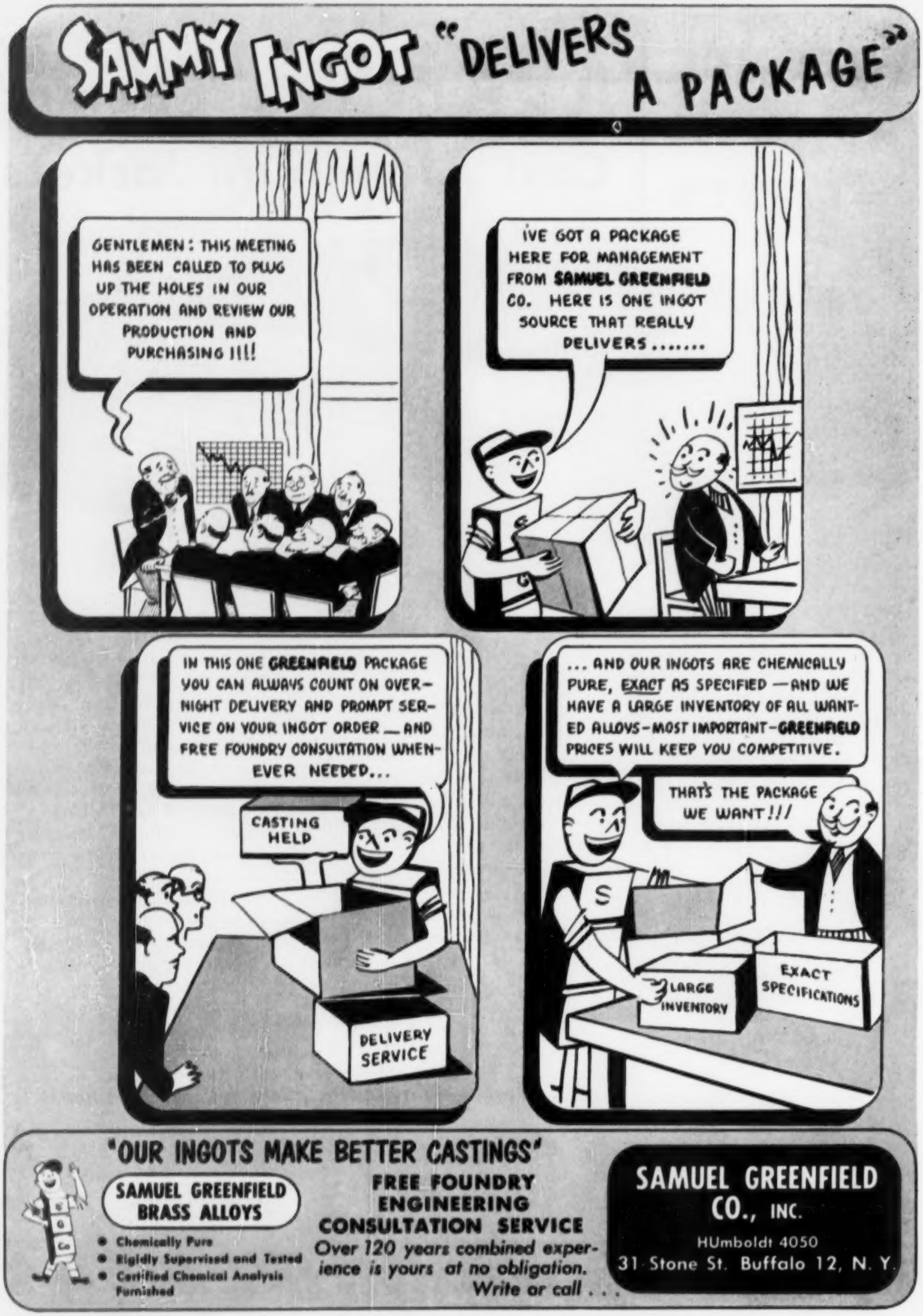

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Review of research and development work sponsored in the field of materials and processes over the past decade. Abstracts of Wright Air Development Center technical reports from July 1, 1951 to June 30, 1953 are included. Also a summary of technical reports published in the areas of metallurgy, textiles, petroleum products, structural materials, rubbers, plastics, packaging, protective treatments, analysis and measurements.

Report on the Elevated-Temperature Properties of Selected Super-Strength Alloys.. Ward F. Simmons and Howard C. Cross. 208 pp. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 1954, $4.75.

A graphic summary of the elevated temperature strength data for 13 selected super-strength alloys. A brief description of each alloy gives chemical composition, recommended heat treatment, a few words about forging and machining.

Fatigue of Aluminum.. R. L. Templin 63 pp. 27 fig. 497 ref. American Society for Testing Materials, 1916 Race Stret, Philadelphia 13, Pa. 1954. $1.50.

Third Gillett memorial lecture discusses fatigue of aluminum toward the end that the useful lives of aluminum-alloy structures and machines subjected to repeated loads in service may be extended.

Sections include brief description of fatigue phenomena, fundamental mechanism of fatigue failures, evaluation of fatigue properties, factors affecting fatigue strength, and fatigue tests of machine and structural components.

Advanced Cost Accounting Methods for Gray Iron Foundries—Cost Manual No. 2.. 68 pp. + Cost Manual No 1.. 51 pp. Gray Iron Founders' Society, Inc., National City East 6th Building, Cleveland 14, Ohio. 1954. $5.00.

Advanced cost accounting system for both large and small foundries is an outgrowth of Cost Manual No. 1, which is included as a supplement in the new manual. Written to be easily understood by persons with even limited account-

ing experience. Describes advance treatment of the subject in all operating departments of a foundry.

American Standard Minimum Requirements for Sanitation in Places of Employment. . Z4.1-1955. 11 pp. American Standards Association, 70 East Forty-fifty St., New York 17, N.Y. 1955. $0.50.

Prescribes minimum sanitary requirements for the protection of employee's health. Covers drinking water, washing and toilet facilities, rest and change rooms.

Research on Shell Molding PB111401 .. Foundry Section, Metal Processing Division, Department of Metallurgy, M.I.T. 56 pp. 15 fig. 28 ref. U. S. Department of Commerce, Office of Technical Services, Washington 25, D.C. 1953. $2.00.

Final report on research directed toward lowering cost of shell molding by use of less phenolic resin.

Interpretation of Engineering Data: Some Observations. . Harold F. Dodge. 40 pp. 22 fig. 19 ref. American Society for Testing Materials. 1954. $1.50.

Edward Marburg Lecture on interpretation of engineering data from the viewpoint of quality engineering.

Theoretical Structural Metallurgy .. A. H. Cottrell. 2d ed. viii + 251 pp. 132 fig. St. Martin's Press, Inc., 103 Park Avenue, New York 17, N.Y. 1955. $4.50.

First edition rewritten and new topics such as theory of dislocations, surface tensions of grain boundries, and physical metallurgy of carbon and nitrogen in ferrite added. Theoretical rather than experimental approach for students of metallurgy. Further references for reading at end of chapters.

Metal Statistics — 1955 . 48th ed. 864 pp. American Metal Market, 18 Cliff Street, New York 38, N.Y. 1955. $3.50.

Statistics on domestic and foreign production, prices, imports, exports, etc. of ferrous and nonferrous metals. Among tables not previously presented are those on

shipments by domestic copper and brass mills; primary aluminum production by U.S. and Canada, consumption of nickel in U.S., and official specs for zinc die castings. Buyers directory.

Metal Industry Handbook and Directory—1955.. xvi + 472 pp. The Louis Cassier Co. Ltd., Dorset House, Stamford St., London S.E.1 England. 15s.

Four sections: General Properties of Metals and Alloys; General data & tables; Electroplating & allied processes; Directory.

Directory lists trade names, metal trade associations and societies, technical institutions, buyers' directory, and addresses of firms in buyers' directory. All firms, societies, etc. are English.

Fifty Years on Tracks.. 104 pp. Caterpillar Tractor Company, Peoria, Illinois. 1954. $1.25.

History of track-type tractor from 1904, when the Holt Manufacturing Comany, a predecessor of Caterpillar Tractor Co., introduced the first practical model, until 1954. Book features numerous photographs, some more than 60 years old. Last quarter of book depicts Caterpillar as it exists today.

Plastics Tooling.. Malcolm W. Riley 135 pp. illus. Reinhold Book Division, 430 Park Ave., New York 22, N.Y. 1955. $250.

One of the Reinhold Pilot Book Series, this book was written to bring up to date information on the resins and methods used and the major applications of plastics tooling. In non-technical language, book includes chapters on metal forming tools and die molds and prototypes .Bibliography.

Non-Ferrous Foundry Metallurgy.. A. J. Murphy (ed.) x + 497 pp. Mc.Graw-Hill Book Co., 330 West 42nd St., New York 36, N.Y. 1954, $12.50.

The metallurgy of the alloys and the processes in non-ferrous foundry work is dealt with in a manner which recognizes that progress in this branch of technology has ceased to depend on the development of operative skills and must

be based upon their understanding and application of scientific principles.

The book, which was written by experts in the various fields discussed, covers the general principles unifying the foundry techniques of all the industrial nonferrous metals in relation to metals in the liquid state, to the process of solidification and to the factors influencing the properties of casting. Other new materials include the part played by gas dissolved in liquid metals, its control and its influence on cast products; factors influencing the grain size of castings; mechanical properties of castings as complete components compared with the properties in conventional test samples. Numerous illustrations and bibliography at end of each chapter.

Manganese (Metallurgy of the Rarer Metals No.3) A. H. Sully. xiv+305 pp. 138 ref. Academic Press, Inc. 125 E. 23rd. St., New York 10, N.Y. 1955. $6.50.

Written as a textbook and also for reference purposes, the book begins with a history of manganese its occurence and classification. Further sections appear on production of Mn ferroalloys and pure Mn, conservation and recovery, physical properties, constitution and properties of alloys, ternary alloys, and workability, electroplating, and surface reactions at high temperatures, and properties. References at end of chapters.

Bibliographic Survey of Corrosion for 1950-1951. . vii+435 pp. National Assn. of Corrosion Engineers, 1061 M & M Building, Houston 2, Tex., 1955. $12.50.

The fourth in a series, this survey summarizes 4454 corrosion and corrosion prevention articles. Abstracts are classified by topic according to eight groups which are then subdivided. Cross-references are appended to each section. There is an author index and the subject index lists many products by trade name. Appendix gives information on locating unfamiliar foreign or domestic journals.

NANCY PURUCKER, *Librarian*
American Foundrymen's Society

Die Casting Product Standards Avoid Overspecification

■ Overspecification—the costly process of demanding unnecessarily critical production conditions—has been largely avoided by progressive die casters making use of Product Standards of the American Die Casting Institute according to a report presented at the annual ADCI meeting.

Five Engineering Series Product Standards issued earlier this year were joined by five more at the annual meeting of the organization September 14-15 at the Edgewater Beach Hotel, Chicago. Other standards in the making are on metallurgy and commercial practice.

Re-elected at the meeting were William J. During, Precision Castings Co., Syracuse, N.Y., president, and George Ralls, Pressure Castings, Inc., Cleveland, vice-president;

W. J. During

David Laine and W. J. Parker were re-elected secretary and treasurer, respectively.

Elected to the National Board of Directors by the four ADCI Regional Groups were:

Pacific Coast: J. C. Bennett, Anderson Die Casting & Engineering Co., Los Angeles; R. R. Dreibus, Harvill Corp., Los Angeles; and A. W. Simpson, III, Western Die Casting Co., Emeryville, Calif.

Midwest: Walter Brown, Kiowa Corp., Marshalltown, Iowa; C. W. Omann, Advance Tool & Die Casting Co., Milwaukee; and John Kraus, Racine Die Casting Co., Racine, Wis.

Central: H. H. Weiss, Superior Die Casting Co., Cleveland; George Ralls, ADCI vice-president, and R. A. Luedtke, Schultz Die Casting Co., Toledo, Ohio.

Eastern: C. J. Sheehan, Alumi-

num Co. of America, Garwood, N.J.; W. G. Newton, Jr., Newton-New Haven Co., New Haven, Conn.; and W. J. During.

Directors-at-Large for 1956 are E. L. Anderson, Globe Imperial Corp., Rockford, Ill.; C. L. Anthony, Hoover Co., North Canton, Ohio; J. Koegler, Doehler-Jarvis Div., National Lead Co., Toledo, Ohio; and L. G. Vanderhoof, Stewart Die Casting Div., Stewart-Warner Corp., Chicago.

Ex-Officio members of the Board are A. T. Lillegren, Madison-Kipp Corp., Madison, Wis., past national president, and David Laine.

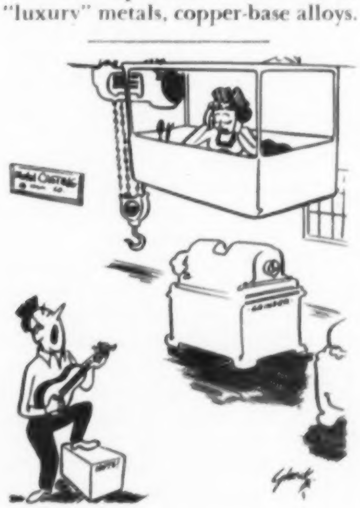
The Annual Doehler Award was presented to Charles Pack, formerly with Doehler-Jarvis Div., for 44 years of pioneering in the die casting industry.

Discussing developments of his industry, Pack recalled that half the post-World War I production went into vacuum sweeper components, with phonographs taking much of the rest.

As for the future, he foresaw greater economies through automation. He observed that zinc price fluctuations sometimes resulted in other metals being favored.

A sufficient supply of virgin aluminum and a normal level of secondary prices are needed for aluminum to meet demand. Magnesium, yet to find applications as extensive as aluminum, is due for a bright future due to its lightness.

Mr. Pack stated that cooperative industry research of the Institute's Die Casting Research Program gives promise of extending die life to allow expansion in the use of "luxury" metals, copper-base alloys.



Flood waters pouring into furnace with 31-ton heat rose to cover windows and the furnace bungs at their peak.

WHY THE HEAT WAS THREE WEEKS LATE

Flood waters were rising fast and there were 31 tons of iron in the furnace

G. B. MANNWEILER/*Research Director*
Eastern Malleable Iron Co.
Naugatuck, Conn.

■ It is most unusual to water quench an entire air furnace containing 31 tons of molten white iron, yet still more extraordinary to remelt that metal again in the same refractories to produce first rate malleable iron castings. The circumstances beyond control described below necessitated this singular melting cycle.

During the first two weeks of August, rainfall in Connecticut was so abnormally heavy that by the 18th of the month most streams in the state, many of which are normally only trickling streams, had swelled to nearly fill their channels. The forecast "Rain and Warm" for the next day, Friday, caused no concern, for it was typical of that period. The threat of hurricane Diane had apparently passed, so the state's citizenry retired Thursday, anticipating just another normal day to follow.

Almost before the new day, the skies throughout the state emptied torrents of rain upon the already-saturated landscape. This exceptionally heavy and continuous downpour over the watersheds of the rivers quickly converged in the narrow valleys. The river channels were unable to handle the additional deluge and flowed over into their flood plains. Before the day was half over, many localities recorded 9 to 10 inches of rainfall in those few hours—about one quarter the normal precipitation for a whole year!

Winding through highly populated and industrialized centers, the Naugatuck river soon became a raging expanse of destruction. Where the valley constricted these rampaging waters, the velocity became great enough to tear whole buildings from their foundations, rip them apart, and scatter the wreckage on downstream. This debris smashed into all things which stood in its path. Automobiles and even railroad cars were tossed about by the torrent. Floating oil and gas storage tanks, ripped from their bases, piled up behind the now submerged bridges until the spans could resist the force no longer.

Start Melting at Midnight

Quite a way downstream lay the Naugatuck Works of the Eastern Malleable Iron Co. In preparation for the usual work day on Friday, the air furnaces at the plant had been charged the night before. Since the No. 3 air furnace had 31 tons in its hearth, firing with the unit coal pulverizer was commenced at midnight, to allow the customary 27 minutes per ton of charge for melting down and superheating.

Aside from noting the heavy rain pounding on the foundry roof, the furnace man was quite oblivious to what was taking place on the other side of the high railroad bank that separated the plant from the river. There the water level was rising at an astonishing rate. Buildings on the opposite banks were being inundated. By 5:30 am the river had begun to back up through the storm sewers and flow out over the street that bisects the buildings of the plant.

Meanwhile, the river had risen to the understructure of the bridge that spanned the stream just above the plant. Debris began to collect behind the bridge, forming a partial dam, which shunted some of the river water over the lower approach to the bridge and on down the street, converting the roadbed into a fast-flowing stream.

Fed by these two sources, together with the rain which continued to fall, although less intensely, the waters started to surround the lower buildings of the foundry, making it quite apparent that the situation outside had become very serious. The limited personnel in the plant at that early hour attempted to build dikes across doors

and other passageways, but, with the flood rising at better than a foot an hour, these efforts proved futile and were abandoned.

By 6 o'clock the metal charge in the No. 3 furnace had completely melted, but it was too viscous to get through the tap holes for pigging. Thus, there was no other alternative but to shut down the firing and hope. A section of bungs was removed to permit easy escape of steam, in the probability that the water would soon get over into the hearth.

In the other malleable melting facilities of the Naugatuck Works the charge, while under fire for two hours, had not melted down. Hence, the threat of explosion was much less than in the case of the No. 3 furnace. The battery of 400-pound melting furnaces in the aluminum foundry was shut down also and the melts hastily pigged just before the water came over the molding floors.

About 7 o'clock the power to the entire plant was thrown off as a preventive measure. By then the water was knee deep in most areas. The swiftness with which the flood rose permitted the rescuing of only limited records, which were transferred to the second floor of the main building. Telephone service had failed by this time.

Water Hits Furnace

At approximately 8 am water poured into the draft opening at the base of the No. 3 furnace stack and hit the rear bridge wall. The resultant violent generation of steam charged back out the stack opening into the foundry. Some deterioration of the bridge wall occurred due to the severe thermal shock. By another half hour, the water had reached the level of the furnace hearth, generating tremendous quantities of steam, but without causing any damage. Remaining personnel were removed by rowboat to higher ground.

The flood waters continued to rise throughout the morning until they had reached a height of approximately 9 feet on the street. In the foundry, the flood level peaked at about 8 feet, well over the bung arches of the melting furnace. By midafternoon the rains had ceased and the waters began to recede. Before another 24 hours had passed the flood water had disappeared, leaving from a few inches to over a foot of mud and slime over everything it had enveloped.

Wood floors had swollen and buckled. Every piece of machinery had to be thoroughly cleaned and dried out before returning to operation. All electronic instruments —recorders, switches, relays and controls—throughout the plant had to be completely reconditioned, most being returned to their manufacturers. Many records were lost; others were made valueless by water and mud. Still other records were inaccessible due to swelling of wooden desks and filing cabinets.

How to remove the huge 31-ton chunk of iron from the water-saturated melting furnace presented some problem. It could not be lifted out, as the overhead crane was limited to five ton loads. Obviously it was too large to burn into segments with a cutting torch. Therefore, it was decided to melt it out after drying out the refractories as much as possible by a slow preheat.

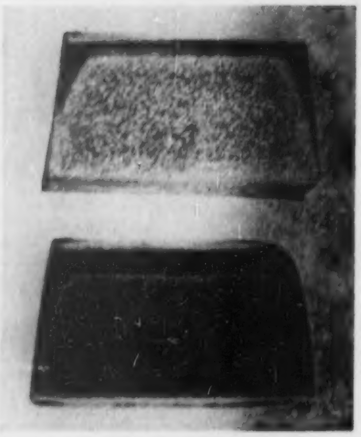
Accordingly, during the week after the flood, the rear bridge wall was broken out and completely rebuilt. The rest of the furnace refractories were not touched, even although they had already been through four and one half heats prior to being water quenched. Heavy wood fires were then laid over the slab of iron in the hearth. These were continued daily for almost two weeks.

Meanwhile, the coal pulverizer, blower, and motor were being overhauled and by Labor Day, September 5, they were in operating condition. Also, most electric services to the plant had been restored. To expedite the drying process, the furnace was put under fire for intermittent periods of 30 to 60 minutes. Since the coal supply at the plant was thoroughly soaked with water, new dry coal was brought in by truck, all railroad lines servicing the Naugatuck valley having been washed out.

The intermittent firing was continued through Thursday, September 8. At times during this period the slag on the iron was molten. Small quantities of steam seeped

Above . . Two weeks of wood fires dried out the water quenched air furnace; the rear bridge wall was rebuilt and the 31-ton iron slab melted.

Below . . Much of the 9-in. service lining had burned, spalled, or eroded.



Normal heat treat gave re-melt a white fracture (top); extended cycle produced fully malleablized fracture (bottom).

out around the base of the furnace. A hole about a foot deep was drilled into the furnace bottom just below the steel siding and temperature readings of 220 to 295 F were obtained there, indicating sufficient temperature to volatilize moisture.

Anticipating an oxidized heat, three tons of malleable pig iron were scattered over the iron slab and at 10 pm Thursday the firing was again started and maintained. About midnight, or two hours after firing, when the iron mass had melted down, there was considerable "boiling" of the metal—presumably steam evolved from the bottom. This reaction continued through the remainder of the heat, although at a gradually diminishing rate. A break-out around the front tap hole block occurred around 7 am and this was sealed up.

At 8:20 am a sample was taken for chemical analysis. This showed extremely "high" iron (see table) indicating that severe oxidation had taken place. A rather heavy sticky slag persisted which would preferably have been skimmed off prior to making any alloy additions. However, owing to the spalling and erosion that the brickwork was undergoing, it was feared that the refractories might fail before the heat could be taken. Therefore, additions were made immediately in an attempt to deoxidize the melt and to restore it to the desired composition. 600 pounds of 50% -Si ferrosilicon, 600 pounds of 20% -Mn spiegel, and 500 pounds of petroleum coke were added and rabbled in briefly before tapping the heat.

The iron was poured off into molds that had been made on Wednesday. Analyses of samples taken at the beginning, middle and end of the heat (table) revealed lower recoveries from the alloy additions than would normally be anticipated, presumably through loss to the slag. While optical pyrometer readings indicated good hot iron, its fluidity seemed on the low side. This was evidenced by misruns in some of the light work ordinarily cast in this shop. It was attributed to the oxidized condition of the iron and to the relatively low carbon and silicon contents for this class of work.

Nevertheless, three weeks to the day that it was scheduled, the heat was finally poured off and, while the misrun scrap was above normal and a higher tendency toward shrinkage was evident, most of the melt produced good, sound castings.

After the heat was out, the furnace was inspected and in several places the 9 in. hard-burned Missouri service lining had completely burned, spalled or eroded away, exposing the $4\frac{1}{2}$-in. safety wall. Over the following weekend the furnace was relined, except for the front (burner) wall, and normal operations resumed.

To check on the annealability of the iron poured from this heat, a test wedge $1\frac{3}{8}$-in. wide, 9 in. long, and tapering from $\frac{1}{4}$ to $1\frac{1}{2}$-in. was cast. This was put through the standard 48-hour electric-furnace malleablizing cycle along with a similar wedge that was cast from an earlier and normal heat. Following the treatment, the fracture of the latter was found to be fully ferritized. However, the wedge cast from this abnormal heat had a marked sparkle throughout. A microstudy of this wedge revealed that, while first-stage graphitization had been completed, considerable secondary carbides (as coarse laminar pearlite) still remained.

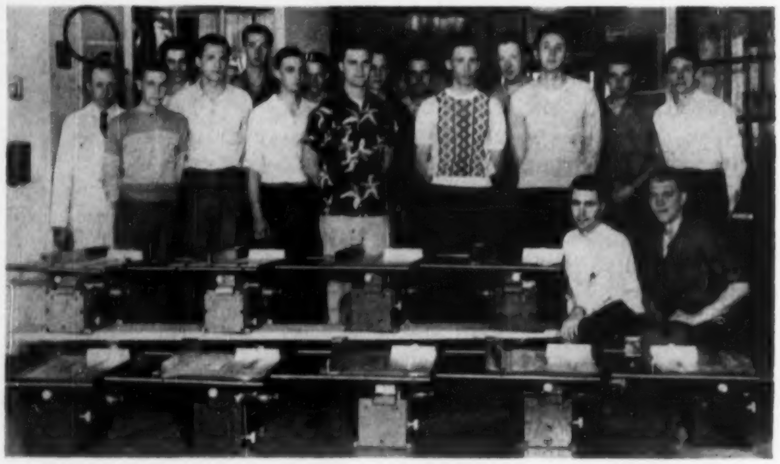
On the basis of this finding, a full furnace load of castings from the heat in question was given a standard first-stage treatment, but the rate of cooling through the critical during second stage graphitization was reduced to 1 F per hour, or approximately 48 hours between 1380 F and 1340 F. Upon concluding this treatment, representative castings from various parts of the load were broken and others were studied under the microscope. Some traces of pearlite remained in most samples. Therefore the load was returned to the furnace, heated to 1340 F and held at 1320-1340 F for 72 hours. Sample castings were found to be fully malleablized. Tensile test bars from this heat and extended anneal gave the following averaged properties: ultimate tensile strength, 54,900 psi; yield strength, 37,200 psi; elongation, 20.5 per cent in 2 inches.

ANALYSES OF "FLOODED" IRON

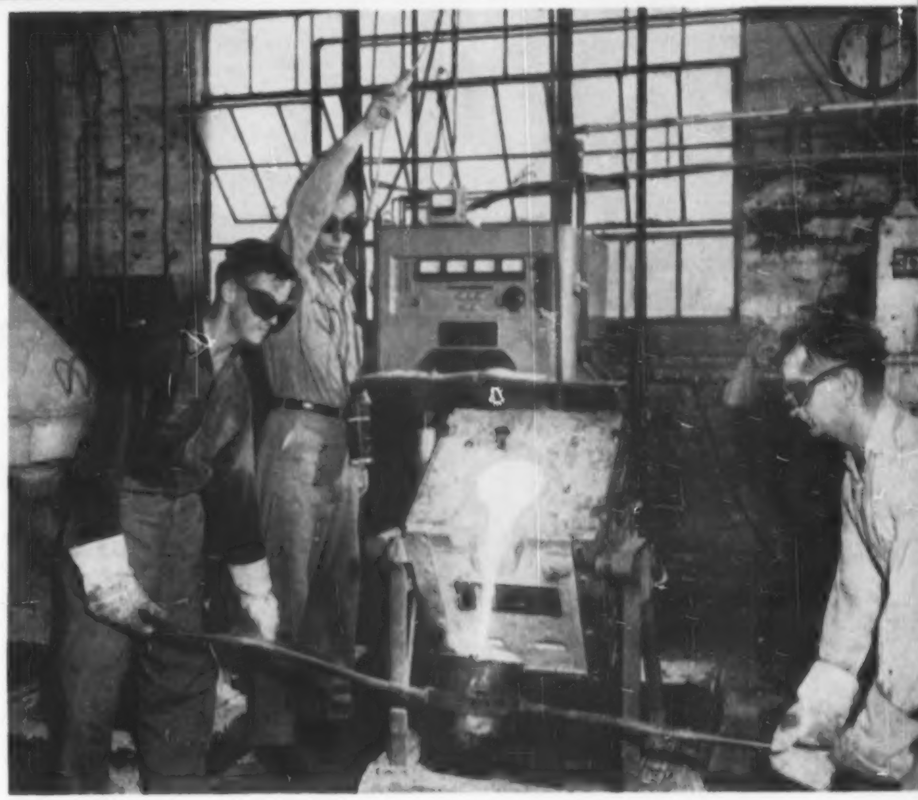
Sample	TC	Si	Mn	S	P	Cr
Charge (calculated)*	2.80	1.14	0.49			
Prelim. (8:20 am)	2.07	0.43	0.14			
Final: First iron (9:55)	2.14	0.91	0.35			
Mid heat (10:25)	2.16	0.97	0.34	0.087	0.138	0.017
Last iron (10:50)	2.16	1.04	0.33			

*Does not include 3-tons pig iron added before final firing

Students Cast Parts for Table Saw



Above .. M.E. Students at University of Idaho make table saws under Prof. H. W. Silha (far left). Department head is N. F. Hindle, former AFS technical director. **Below** .. Project castings on display. Part of course emphasizing design limitation of manufacturing processes and materials.



A RED HOT IDEA

W. W. Edens / *Supervisor*
Melting Metallurgy Section
Allis-Chalmers Mfg. Co.

Here's how a hot charcoal cover helps produce superior copper-base castings

Dear Editor:

I was interested in your Talk of the Industry *feature in the July issue of MODERN CASTINGS in which you comment on holding non-ferrous metals for extended periods without deleterious results. This is, of course, possible and the conditions you cite are optimum if certain precautions are used. Not only can the metal be held but the melt quality is excellent.*

■ About ten years ago at Ampco Metal, Inc., Milwaukee, I had the experience of melting high copper alloys (beryllium copper, chrome copper, and beryllium nickel copper) in high frequency furnaces (960 cycles). A melting technique was developed which included the use of charcoal on the top of the melt that produced very high quality metal with excellent analysis control. In this case, analysis control was especially important since some of the alloys were conductivity copper alloys used in resistance welding wheels and contacts.

The most important feature of this melting technique was the use of red hot charcoal as a melt cover. The charcoal was red hot when placed on the melt—not heated by the melt. The as-cast density and physical properties of metal melted under these conditions approached those of wrought material of the same composition. The reasons for the success of this melting technique are fundamentally sound.

It is axiomatic that if we do not put gas into our metals during melting, there will be none to come out during solidification. All forced-air fuel-fired furnaces allow the molten metal to be in contact with the products of combustion and precombustion. The merits of melting oxidizing, and the hydrogen-oxygen equilibrium as it effects gas porosity in castings, has been thoroughly documented in the literature and the technical discourses of the American Foundrymen's Society. The fact remains that all forced-air fuel-fired furnaces have a gas atmosphere which can introduce gases into the metal.

This is not to say that fuel-fired furnaces are no good and should not be used. However, it does mean that they must be intelligently used and the "pour as soon as the metal is ready" technique is certainly recommended.

Electric induction melting furnaces of the low or high frequency type do not have products of fuel combustion and so our metals do not come in contact with a primary source of harmful gas. This is largely true of the electric indirect arc furnaces also, at least as far as harmful gas is concerned. This satisfies the first requirement. If we do not want harmful gases to get into our metals it is reasonable that we do not expose them to harmful gas atmospheres.

Now, as to the use of a red hot charcoal cover. Charcoal is known to be very hydroscopic. It will absorb moisture from the surrounding air very rapidly and in copious quantities. In addition it contains combined or chemical water which is not driven off by heating above the boiling point of water. If we place room temperature charcoal on the surface of molten copper or aluminum alloys we are literally adding water to our melt. This is to say that we are allowing nascent hydrogen, the decomposition product of the water, to enter our melt. Molecular hydrogen does not bother us.

Preburned or red hot charcoal does not contain water. By covering the melt with red hot charcoal we again do not expose our metal to harmful gases.

Induction furnaces by their very nature cause a considerable stirring action in the metal. If the surface of the melt is not covered, considerable oxidation can and does take place. This can be corrected by proper deoxidization practice prior to pouring. If preburned charcoal is used it produces a very satisfactory cover which not only minimizes economic loss of metal through oxidation but also serves to reduce the oxide content of the metal. Oxygen-free copper is made by pouring molten copper through a bed of burning charcoal.

It seems apparent that under the stirring conditions of induction melting an extremely high degree of deoxidation is accomplished by the charcoal. This, of course, is also favorable since the lower the oxygen content of our molten metals the more likely we are to avoid the water vapor reaction in the mold which is another very potent source of gas porosity in castings.

All told, it's the same old story. What we do not put in, we do not have to take out—or have come out at an embarassing moment when the casting is almost solidified in the mold. I have no argument with the thought of holding copper-base alloys for 2-½ days or longer when we eliminate the potential sources of gas and also prevent progressive oxidation of the melt. Metal can probably be held this way until furnace or refractory failure occurs.

Whether we hold the metal or not I know from experience that this melting technique does produce very high quality metal.

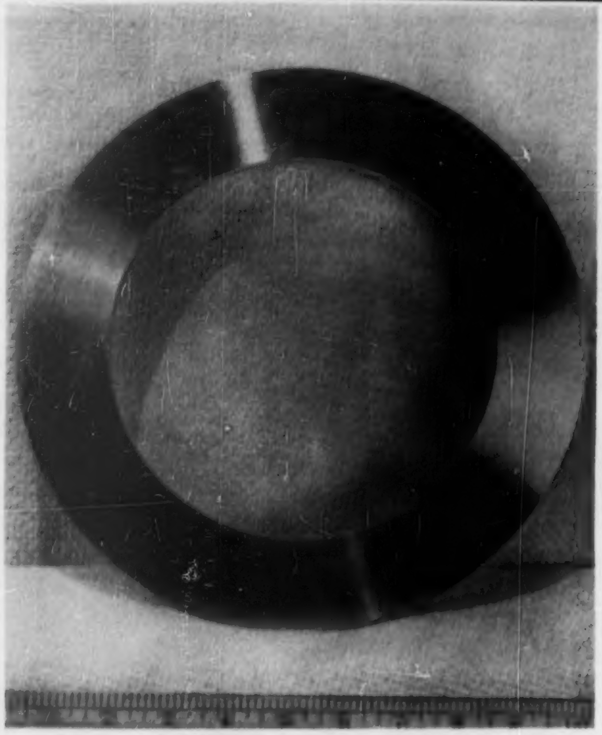


Fig. 1 . . Centrifugal stainless meets x-ray quality.

Hiram Brown / *Chief Metallurgist*
Solar Aircraft Co., Des Moines

A HARD LOOK AT THE CASTINGS INDUSTRY

Overselling, underselling, bad selling, secrecy how do they restrict the foundry market?

Originally entitled "Evaluaton of Casting Processes," this was the official exchange paper from the American Foundrymen's Society to the Institute of British Foundrymen's 52nd Annual Meeting last June in London.

The author approaches the subject from two widely divergent points of view, (1) molding methods from a technical viewpoint, and (2) a discussion of castings as seen by the author based upon his experience in specifying, procuring and testing castings for use in the jet- and gas-turbine industry.

The author seeks to clear up the misconceptions of engineers and designers about the properties of castings and about casting processes in general and begins with a discussion of the advantages of castings.

■ Castings have many properties which make them desirable for both structural and non-structural applications. They are not just a substitute to be used when parts fabricated by some other method are in short supply. In fact, there are many cases where casting can successfully replace other methods of fabrication strictly on the basis of merit.

Because many of their good properties are not always understood by designers, castings are often regarded as inferior, and are often compared unfavorably with wrought products. All too often this comparison results from half truths, fallacious reasoning, or more generally ignorance of what castings have to offer. It should be stated emphatically that there are many advantages of castings which enable them to compete successfully with other fabricated forms for many uses when the facts are examined fairly, honestly and thoroughly.

Casting is the only process which has but slight limitation on size, shape, and intricacy. Parts which weigh either a fraction of an ounce or many tons are being cast. Be-

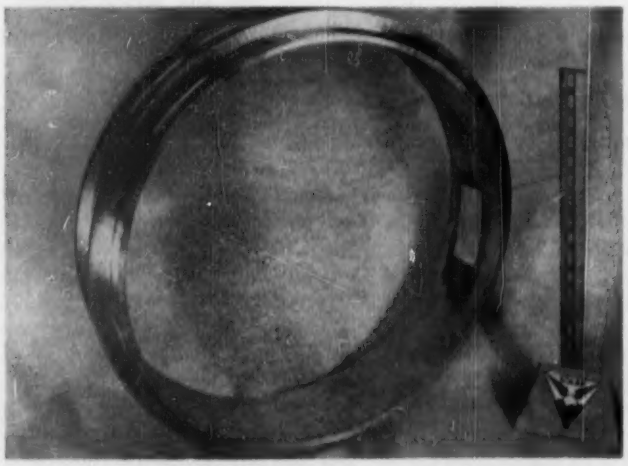
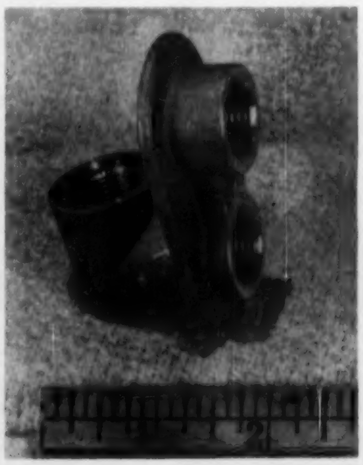


Fig. 2 . . Minimum machining on centrifugal casting.



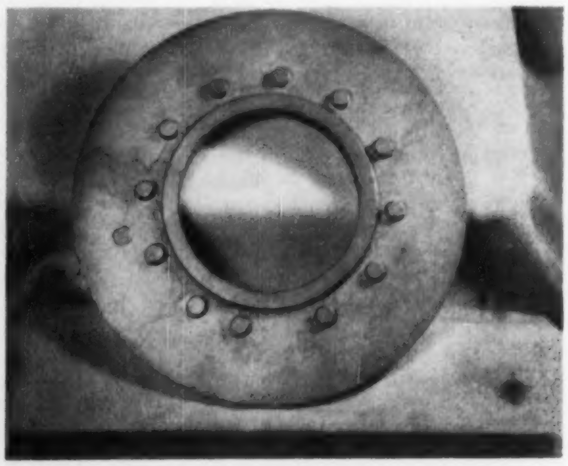


Fig. 3 and 4 . . Poor radiograph passed porosity (left) and large grains (right).

cause of the plastic nature of most molding materials, molds can be shaped to almost any desired configuration. Due to the fluidity of molten metal it can be made to reach even remote corners to fill previously determined contours.

In many cases, parts can be cast to size and shape with a surface finish that requires no machining, and close tolerances can be held. In cases where the extremely fine finish required can be obtaind only by machining, castings can minimize machining, since the essential shape desired can be cast and only finish, clean-up, cuts need to be taken. For example, Fig. 1 and 2 show typical centrifugal, stainless-steel castings which are meeting aircraft x-ray quality standards and which require a minimum of machining to make the final part.

This contrasts sharply with parts which must be hogged out of bar stock, or forgings which do not even approximate the final shape desired. There are some very hard and tough alloys which are extremely difficult to machine; in many cases these can be cast close enough to size and shape that only grinding is required to bring the parts within tolerance.

▪ Other advantages. One factor often discussed is the relative strength of castings versus wrought material—a story which is often distorted—and it seems advisable to make a definite statement about this. The mechanical properties of cast and wrought material, having the same composition and heat-treatment are usually quite similar.

This statement appears to be contradictory in view of the higher properties usually quoted for wrought alloys. However, those high properties given for wrought material usually represent tests taken in the direction of working. These will normally be higher than cast properties; however, properties of wrought parts tested in the transverse direction will be lower than those of castings. This points out one definite advantage of castings and that is their uniform, nondirectional properties. Test results of specimens taken from a casting should be in close agreement regardless of the direction in which samples are taken.

Another important advantage of castings is their dimensional stability. In machining many wrought parts it is found that they will warp or distort out of shape. During rolling or forging the metal grains are distorted out of shape and hardening results. The strained grains are held in an unnatural position and shape and are trying to return to their natural state. When some of the stressed area is removed by machining, the remaining stresses attempt to redistribute themselves and distortion takes place.

Furthermore, if wrought parts are heated to remove stresses, severe distortion and warpage can occur. Re-shaping after stress relief may be necessary and this is often difficult to accomplish. On the other hand, casting grains, because of the way they are allowed to crystallize in a natural pattern with a minimum of restraint, tend to be equiaxed and relatively free from residual stress so that dimensions are much more stable during machining or heating.

▪ Grain size. Castings are also noted for the stability of grain size. The grain size of most cast metals —provided they have not been plastically deformed by working—cannot be changed below the melting point. (The only exceptions to this are alloys, such as steel—which undergo an allotropic change accompanied by a complete change in crystal structure with the formation of new grains.) This is true no matter what the grain size is in the cast metal but is not true of wrought materials, since grain growth can occur at relatively low temperatures.

Normally, stress-free metal grains are so shaped that, on the average, their diameters are equal in all directions (equiaxed). If metal is deformed when cold, the grains are similarly deformed. When such deformed grains are heated, a temperature is reached where re-crystallization will take place and the broken and distorted grains will assume an equiaxed shape. This temperature will be lower the greater the amount of cold work and the smaller the grain size before working. As the temperature increases above this re-crystallization temperature, grain growth can occur—small grains may join to form larger ones and larger grains may absorb smaller ones. This grain growth may go on through several heating cycles until a very large grain-size results. In a similar way, hot-working will break up grains into smaller grains and when such material is subsequently heated there will be fewer and larger grains.

This wide disparity of grain gradients does not exist in castings. With few exceptions, as mentioned earlier, cast alloys will undergo no change in grain size at any temperature below the solidus line. Even in the case of the few exceptions, the temperature for re-crystallization and grain growth of wrought alloys is much lower than the temperature of the transformation heat-treatment that would be necessary to cause a change in the grain size of a casting of a similar alloy. Castings do, therefore, have a much more stable grain-structure and are not so likely to undergo grain growth. This is an important factor where in-process stress-relief treatments are necessary during fabrication of assemblies.

▪ Design. Because castings are practically unlimited by size or shape, a casting can be designed very close to engineering requirements so that metal can be placed at the desired location, thus making it possible to obtain better strength: weight ratio. This is not true of processes which are limited in regard to size and shape and where design must be based on fabricating requirements rather than the optimum strength:weight ratio.

With these many advantages in their favor, it would seem there would be a clamor for castings for structural uses. Unfortunately, this is too often not the case for reasons which will be discussed later.

▪ Evolution of casting processes. It is interesting to theorize whether sand or diecasting was the first to be used. There is evidence which gives credence to the idea that at a very early date metal shapes were cast in stone molds. Those molds probably represented the first type of permanent molds. It is certainly not hard to visualize that prior to this time simple shapes had been cast by scooping holes in sand or

Fig. 5 . . Large grains in stainless steel that lead to many troubles.

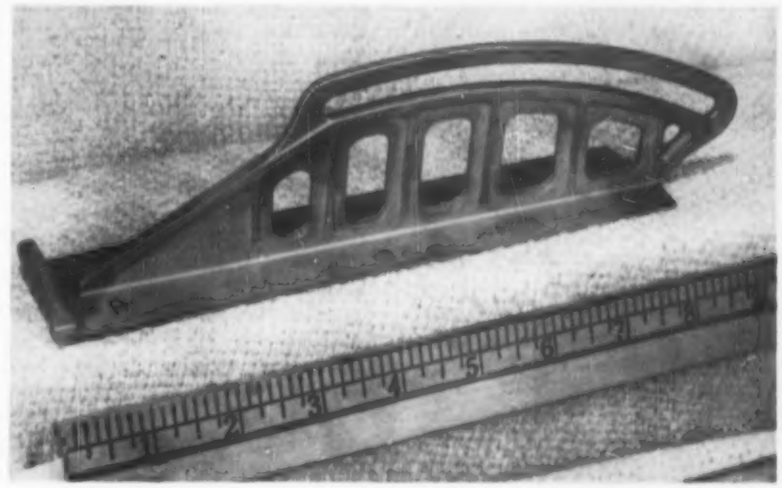


Fig. 6 . . Good technique is required to cast large and complex shapes.

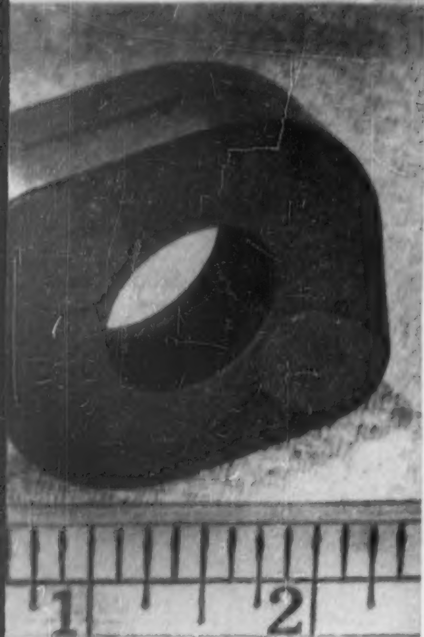


Fig. 7 . . Failure to vent gas led this casting to scrap pile.

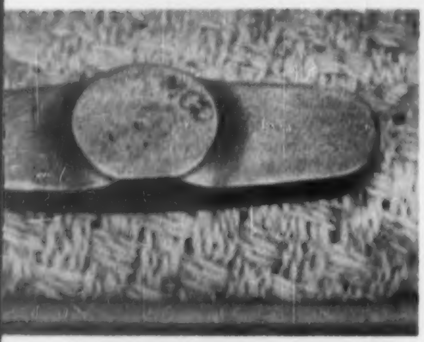


Fig. 8 . . Too much shrinkage, machining replaced casting.

clay in the ground and pouring metal into them.

Since shape and utility rather than high quality were the determining factors, proper gating and pouring techniques probably received little consideration. Many people today have the opinion that the foundry business has changed very little since that time; however, foundrymen themselves know that there have been termendous strides made in recent years. Nowhere is this so typified as in the parade of "precision-casting methods."

As far back as most can remember, the term "precision casting" has been applied to some form of casting. It was probably first coined thousands of years ago when some man found that he could cast better replicas from a shape carved in stone than by pouring metal into a hole in the ground. It was probably revived when the Chinese found they could cast rings onto bronze pots by the use of the "lost wax" process.

Of course, few can remember that far back but most can recall the modern counterpart of this history. Instead of a hole in the ground foundrymen found that a shape made in a mass of sand could be easily and cheaply prepared and filled with molten metal to form castmetal parts. Then someone found that shapes carved into metal molds offered certain advantages. The use of the word "precision" came into common usage in comparing those "diecastings" with sand castings.

After that, pressure-die-castings usurped the role of "precision" castings; then came plaster and investment "precision" castings, and now there is "shell molding" as the newest member of this family. In each case, as the new process made its appearance it was accompanied by a colorful promotion program inevitably accompanied by some overselling; some companies even use the word "precision" in their title. Eventually each type of casting process has settled into its proper place. Is shell molding going through that same phase to-day?

▪ What is precision? Let it first be established what the word "precision" means. Precision is defined as accuracy, which in turn is defined as "exact conformity with truth or with some standard." These last four words seem to indicate that precision is a relative word whose actual meaning varies with the standard used to judge it.

What are the factors involved in selecting a casting or the process for producing it? First, is extreme accuracy necessary for the part involved? Will the casting be machined? If so, will a few thousandths more of metal actually be more difficult or costly to remove? Since any "precision" part will demand a premium payment, is the accuracy obtained worth additional cost?

What about the basic strength of the parts? Can strength be sacrificed for greater accuracy? For example, gravity- and pressure-die-castings will be stronger than shell-molded castings of similar design and section size. Generally, sand castings will be stronger and more sound than investment castings.

What about size? There are definite limitations to the size of parts which can be produced by the various processes. At present, sand casting is the only process which is practically unlimited in size of parts produced.

How about shapes, cored holes, or undercuts? These may limit the process which can be used or the tolerances obtainable.

▪ Critical self-examination. Finally, what are the latest advances in techniques in the various fields of casting? Sand castings should not be sold short as precision parts. Foundries now extensively make use of dry-sand molds, skin-dried molds, and new high-strength "green" sands. The fact should not be overlooked that a number of small parts can be produced rapidly and accurately in sand foundries by use of a matchplate pattern, whereas those parts could be made only singly or a few at a time by some of the other processes.

Examine all the methods; check all the factors. Is not precision relative? Then why should there not be precision sand castings as well as precision investment castings? Designers and foundrymen might well avoid the phrase "precision casting" unless it is accompanied by the name of the casting process. Where satisfactory tolerances may be obtained by several casting methods, the phrase "close-dimension castings" is put forward.

▪ Limitations and shortcomings. In reviewing this list of "precision-casting methods," it would appear that Utopia for users of castings was just around the corner. Unfortunately, when one is in the position of designing castings into structural aircraft applications, purchasing such castings, or inspecting them, one finds the picture quite different. It is soon discovered that most of those who write about these processes have told the truth but not the whole truth. Since most of them have something to sell, they do not warn of the limitations or shortcomings of the various processes.

Thus, it is found that in many cases, because of process limitations and/or ignorance or carelessness on the part of many foundries, castings are literally fighting for their life. There are many engineers who will not permit the use of castings for structural parts. In fact, although the author was a foundryman for many years he is finding it increasingly difficult to defend castings in far too many cases.

What is there that causes this condition? Why are castings the only raw products which are normally required to be subjected to 100 per cent x-ray inspection before structural usage? Are these fears groundless, or is there some reason for them?

▪ Pressure-die-castings. Let us examine the various recent "precision casting" methods. Since gravity die-casting has matured and come of age technically, that method is being excluded from this discussion and a start will be made with pressure die-casting. One can obtain pressure die-castings which have good tolerances and finish, but allowance must be made for intricate parts. As-cast strength is good in the unmachined state but may be considerably less after machining. Due to the presence of porosity, unless very high pressures be used full strength cannot be developed by heat treatment and the end use must be based on as-cast properties. Usually ½ in. is the maximum practical thickness limit, tooling and equipment costs are high, and also cost per part for small runs. This makes the use of the process limited for jet-aircraft work, for example, where quantities are never astronomical and design changes are so frequent that every effort is made to minimize tool and die costs.

▪ Investment Casting. The investment casting process made its entry into the field with unprecedented publicity. It was regarded as a panacea; astonishing tolerances and finishes were claimed. Many purchasers were "burned" before the myth was deflated. Tolerances of a few thousandths of an inch rapidly became +0.010 in. and more, depending on size and shape. It can truthfully be said that, in general, personal experiences in buying investment castings have not been good; casting quality has been very poor.

If the castings have been made under radiographic control—as called for in the specifications—then blind film readers must have been used. The author has received many simple parts such as that shown in Fig. 3 which contained large areas of gross shrinkage or entrapped gas. It is not an uncommon practice for x-ray men working with investment castings to use lead screens in the head of the x-ray machine to overcome the mottling effect due to very large grain-size. Unfortunately, however, this also tends to hide other defects or to reduce the sharpness of contrast and detail so that if defects are visible they do not appear to be gross. Whenever such parts are x-rayed without lead screens in the head—as is personal practice—the defects are readily visible and much discussion of results promptly ensues.

Large grain is common, but the author has received some Grade 310 stainless steel parts such as those shown in Fig. 4, which had extremely large grains—sometimes one grain per cross section as shown in Fig. 5. These are undesirable for several reasons:

(a) Bend tests made on sections taken from such castings of 310 stainless steel were quite erratic. Some bent through 180° satisfactorily, others cracked along grain boundaries, with bends as small as 90°, and others showed severe neckdown at the center of the bend indicating that elongation was extremely localized.

(b) In many cases after machining, zyglo tests showed seepage at the grain boundaries and x-rays showed indications of minute cracks.

(c) Large grains exhibit a tendency toward hot-shortness and are likely to crack during casting or welding.

(d) Many high-temperature alloys with coarse grain-size show marked decrease in ductility at elevated temperatures and may actually tend to be hot-short in the engine-operating range.[1]

■ **Importance of casting technique.** Investment-cast tensile specimens in many cases show lower strength than similar sand-cast specimens. Some good, well-established investment founders can produce satisfactory castings of very complicated shape and size such as that shown in Fig. 6. However, it would appear that most investment foundries cast to obtain a given shape only, with little thought being given to proper gating or venting. The recent work of General Motors Research[2] shows how much improvement in properties can be made by changing the gating and supplying adequate vents. Yet despite these findings, many investment foundries seldom use vents, with the result that simple castings such as those shown in Fig. 7 often contain large areas where only a thin metal skin covers holes resulting from entrapped gas.

There is a tendency to regard investment casting as a casting method completely apart from other foundry methods; many people with no previous foundry experience seem to think this sort of casting is simple to do. Effort is made to achieve economy by loading as many parts into a mold as possible and using small gates and risers. Although other types of foundries have found it necessary to de-gas many alloys—especially in humid weather—most investment casters believe they can get along without this bother, or at least they simply omit the degassing operation.

As a result, all the foundry techniques learned by other founders through many years of experience tend to be ignored—and too often the results are horrible to contemplate. In fact, a personal approach is never to order a part to be investment cast if it can be obtained in any other way without unreasonable cost. Figure 8 shows a fairly simple investment-casting which for months did not meet x-ray requirements (because of excessive shrinkage) and the author finally recommended a design change permitting him to machine the part from bar stock.

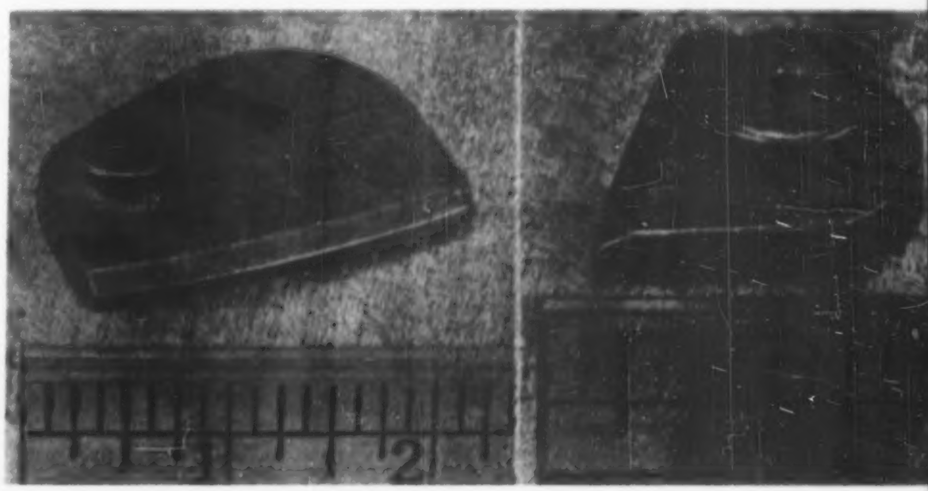
■ **Shell-molding.** Shell-mold casting next made its advent with a fanfare. Operators of the process fell into many of the pitfalls of investment casters. The process was oversold and many expected miracles did not materialize. In most cases, casting finish has not been as good as expected and in many cases is very bad. In some non-ferrous alloys it was found that high pouring temperatures resulted in rough or prickly surface. Low pressure-head tended to improve casting finish.[3] There is some indication that this is also true with austenitic high-temperature alloys. Also, tolerances have been widened, particularly where the parting line is involved or where parts are large and bulging of a shell can occur. Large automatic mold-making equipment has proved to be less than sensational.

Where very close tolerances are promised in shell molds it becomes difficult to get patterns which will give the accuracy desired. Furthermore, a single piece of sand falling into the mold can ruin surface finish in a localized area where no pits are permitted—a requirement which does exist in some of the food and dairy applications for castings. The cost of the binder makes the process rather expensive. The binder, also, in many cases causes a surface pick-up of carbon by steels and where this is undesirable—as in austenitic high-temperature alloys—a diffusion heat treatment is necessary.

■ **Other snags.** Grain size is often very coarse and, although not as bad as that encountered in investment castings, does show severe mottling on x-ray examination and a very diverse grain-size when many castings are sectioned and examined microscopically. The coarse-grain condition is accentuated by super-heating and high pouring temperatures, which are, in many cases, a substitute for good gating practice in helping the metal to flow into the mold. Typical shell-cast parts having mixed grain structure are shown in Fig. 9 and 10, and a typical microstructure (Fig. 11).

There have been reports of difficulty in casting low-alloy steels in shell molds, and so far there seem to be very few occasions where the process is needed for the light metals. In almost all cases light metal parts can be cast in sand molds—with special facings, etc.—with results equalling or surpassing those from shell molds.

It was believed that, because of the thin wall of the shell molds, fine grain would be obtained by rapid heat dissipation and that use of zirconia "sand" or backing up with shot would help promote fine grain-size. Unfortunately, this was too much of an assumption and has not always worked as hoped. The best example of this is the austenitic stainless-steels (containing Cr and Ni). These alloys have very low thermal conductivity and as any kind of chill—mold or insert—cannot conduct heat away any faster than the base metal will give it up, and since these austenitic steels transfer heat very slowly, it is almost impossible to refine the grain by chilling. Thus it has been found that for such metals neither zirconia nor shot back-up appreciably improves the cooling rate over that



Figs. 9 and 10 are typical shell-castings having mixed grain structure.

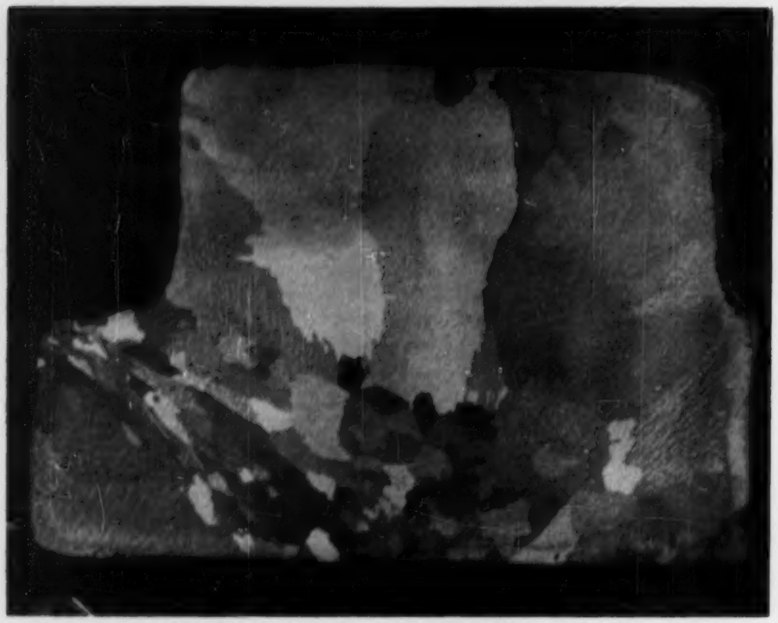


Fig. 11 . . Mixed grain structure evident in typical microstructure.

obtained in silica-sand shell molds.

■ **Conclusions.** From the foregoing observations several conclusions are drawn:

1. New processes are usually oversold and someone gets "burned." It is common to point out to prospective customers the number of parts actually being cast by the new process; however, it should be kept in mind that many of these are being cast only because of the novelty of the process. Someone reads or hears about the process and decides to give it a try. It is, therefore, difficult to evaluate properly a process early in its history. Many special applications will be suited by the process but more standard items must await the test of time.

2. New processes are misused by engineers, who are intrigued by anything new or novel. Thus many parts which will be—or could be—machined economically are cast in investment or shell molds. The part is costly because those processes strive to produce good tolerance and finish. If these qualities are not needed, why demand them or pay the price required?

3. Many very great improvements could be made in sand or gravity die-castings if as much time were devoted to them as is devoted to the "new" processes. The author wonders what the answer would be if each foundryman gave some time to asking himself, "Am I getting all I can out of my present casting process?" The resultant improvements might cut deeply into the "new" processes. Perhaps the new D (Dietert) process[4] or "pressure" molding may be steps in this direction, since both are essentially adaptations of old-established, standard molding methods.

Some sand foundrymen are just beginning to learn that the mold material is just as important as the metal itself; there are good and bad sands and just any sand won't do. There are other mold materials such as zirconia and olivine which merit investigation. Electromagnetic pumping of some metals into die-casting molds can mechanize this process as it progresses further from the state of being an art to the state of being a science.

The gating research work sponsored by the American Foundrymen's Society and performed by Battelle Memorial Institute has pointed the way to improved pouring and gating techniques for the horizontal-type gating such as that normally used in sand casting. Work is now in progress to explore the same techniques in relation to the vertical gating frequently used in die-castings, shell, and investment casting. (EDITOR'S NOTE: Summary of latest AFS vertical gating research appeared in November MODERN CASTINGS, pages 55-56.)

4. Devotees of the various casting methods spend far too much time fighting each other and in closely guarding so-called "trade secrets" and refusing to discuss them with others. This keeps out far more knowledge than it keeps in. As long as efforts are made to maintain the tradition that many casting methods are an art rather than a science, optimum business will not be attained but, instead, potential customers will be alienated. Perhaps the previously mentioned research on vertical gating systems will break down some of these barriers and give a good boost to the entire foundry industry.

5. It would be far better for the casting industry if all foundrymen would pool their knowledge, help each other, and—instead of stealing business from each other—increase the overall market for castings by taking jobs away from competitive industries. The time to start this is before the designer gets his prints drawn up. A casting is most success-ful when it is designed a[s]
and not as a substitute fo[r]
or a welded section. Thi[s]
two aggressive actions:

(a) Time should be sp[ent]
ucating engineers conce[rning]
merits of castings. This s[hould in-]
clude men in industry a[nd]
into college curricula.

(b) When castings are
more time and energy s[hould be]
applied to make them of [...]
ity and less time in co[...]
about high-quality stan[dards...]
requesting downgrading
standards.

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Displays Scope of AFS Publication[s]

Shown for the first time at the Missouri Valley Regional w[...]
portable display of AFS publications. The display was shown at o[...]
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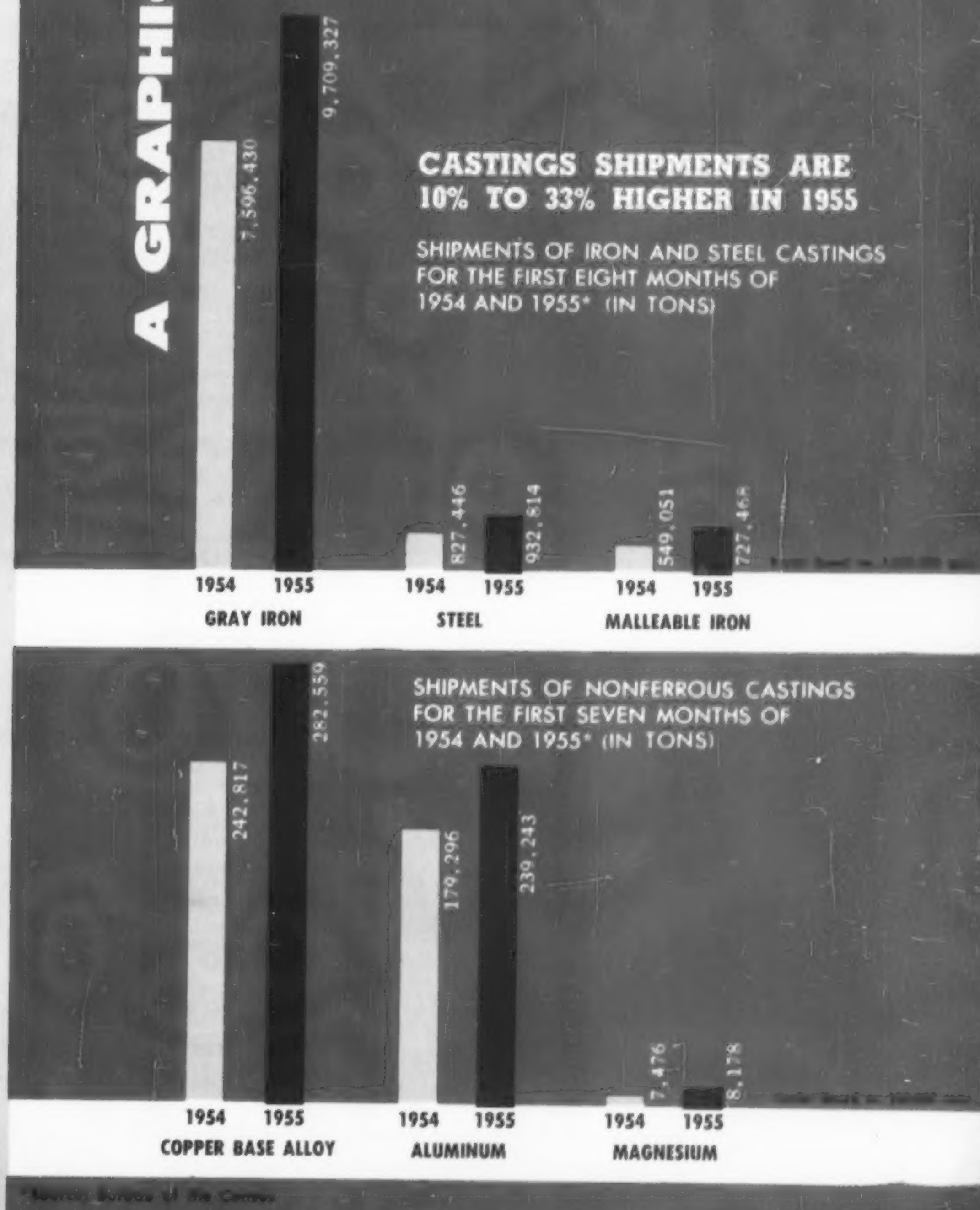
A GRAPHIC LOOK • AT THE CASTINGS INDUSTRY

The editors and the research department of MODERN CASTINGS have gathered this data to help readers get a better perspective of their great industry. It is presented graphically so that trends may be more obvious.

A $2 BILLION ANNUAL MARKET IN A $6 BILLION INDUSTRY

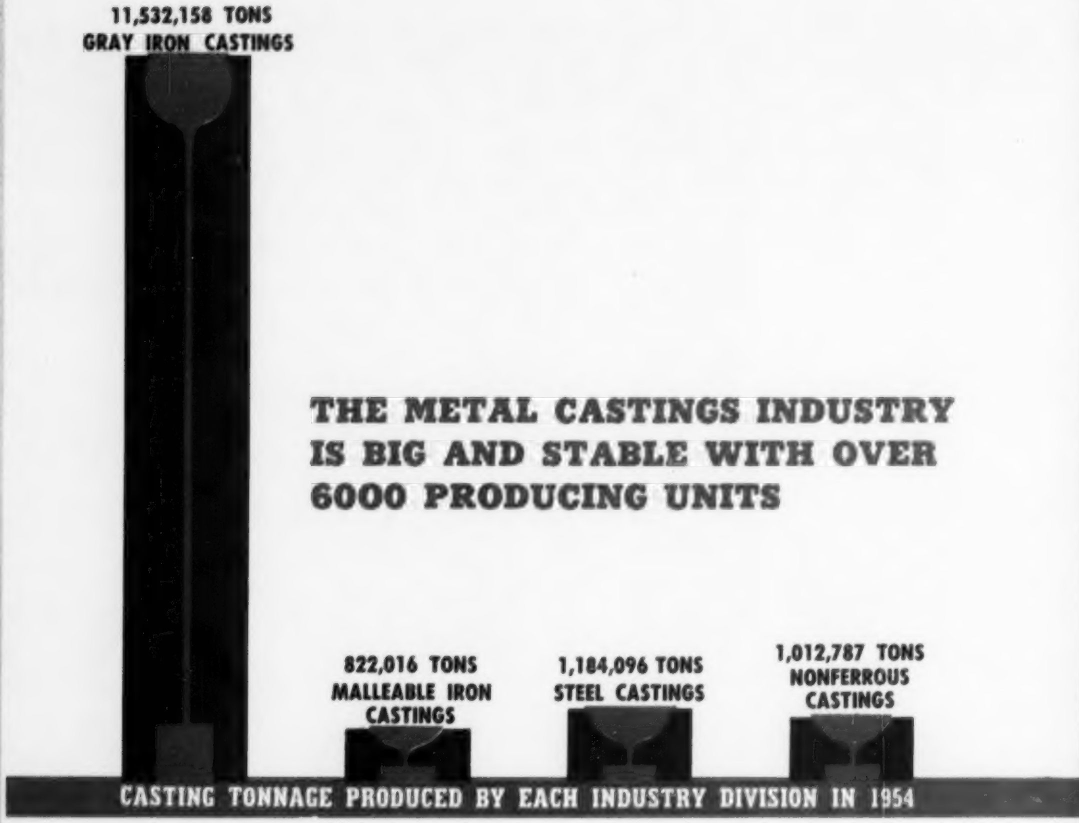
CASTINGS SHIPMENTS ARE 10% TO 33% HIGHER IN 1955



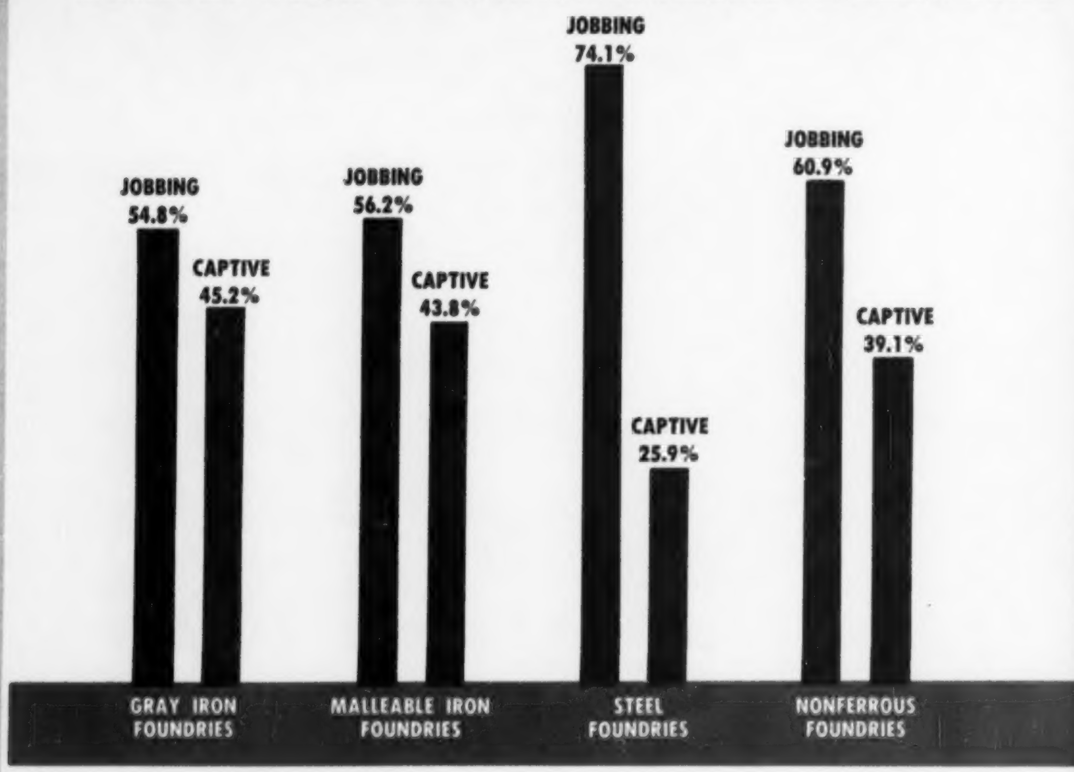
*Source: Bureau of the Census

A $2 BILLION ANNUAL MARKET IN A $6 BILLION INDUSTRY

THE METAL CASTINGS INDUSTRY IS BIG AND STABLE WITH OVER 6000 PRODUCING UNITS



PERCENTAGE OF JOBBING AND CAPTIVE WORK DONE BY EACH INDUSTRY DIVISION DURING 1954



SHIPMENTS OF IRON AND STEEL CASTINGS IN 1954

(IN TONS)

TOTAL	**IRON AND STEEL CASTINGS**	**13,538,270**
	FOR SALE	7,663,274**
	FOR OWN USE	5,874,996
TOTAL	**GRAY IRON CASTINGS**	**11,532,158**
	FOR SALE	6,322,989
	FOR OWN USE	5,209,169

MISC. GRAY IRON CASTINGS
For sale 3,064,886
For own use 4,227,026

CHILLED IRON RAILROAD CAR WHEELS
For sale 294,822
For own use 41,417

MOLDS FOR HEAVY STEEL INGOTS
For sale 843,899
For own use 940,726

CAST IRON PRESSURE PIPE & FITTINGS***
Under 14" (inside diam.) 1,088,002
14"-24" incls've (inside diam.) 217,394
Over 24" (inside diam) 70,275

CAST IRON SOIL PIPE & FITTINGS*** ... 743,711

TOTAL	**MALLEABLE IRON CASTINGS**	**822,016**
	FOR SALE	461,925
	FOR OWN USE	360,091
TOTAL	**STEEL CASTINGS**	**1,184,096**
	FOR SALE	878,360**
	FOR OWN USE	305,736

CARBON STEEL 802,811

RAILWAY SPECIALTIES
For sale 117,310
For own use 2,171

OTHER CARBON STEEL CASTINGS
For sale 460,165
For own use 223,165

ALLOY STEEL CASTINGS (except high alloy) 342,518

RAILWAY SPECIALTIES 15,090

OTHER ALLOY STEEL CASTINGS
For sale 256,142
For own use 71,286

HIGH ALLOY STEEL CASTINGS ... 38,767
For sale 30,196
For own use 8,571

NOTE: Since the 1954 estimates in this table are based on a sample survey, they are subject to sampling variability. The relative standard errors for 1954 data are as follows: 4 per cent for shipments for sale and unfilled orders of miscellaneous gray iron castings; 2 per cent or less for all other estimates.

** Includes a small quantity of alloy (except high alloy) steel castings shipped for own use.
*** Does not include machined, threaded, or assembled fittings.

SHIPMENTS OF NONFERROUS CASTINGS IN 1954

(IN 1,000 LBS.)

TOTAL	**NONFERROUS CASTINGS**	**2,025,577**
	FOR SALE	1,234,465
	FOR OWN USE	791,112
TOTAL	**COPPER AND COPPER-BASE ALLOY**	**835,930**
	FOR SALE	398,266
	FOR OWN USE	437,664

SAND 753,179
For sale 366,907
For own use 386,272

DIE 6,509
For sale 3,607
For own use 2,902

PERMANENT MOLD 48,848
For sale 13,213
For own use 35,635

ALL OTHER 27,394
For sale 14,539
For own use 12,855

TOTAL	**ALUMINUM AND ALUMINUM-BASE ALLOY**	**624,973**
	FOR SALE	480,645
	FOR OWN USE	[1]144,328

SAND 158,473
For sale 131,462
For own use 27,011

DIE 245,291
For sale 172,599
For own use 72,692

PERMANENT MOLD 214,408
For sale 176,584
For own use 37,824

ALL OTHER 6,801
For sale } For own use 6,801

TOTAL	**ZINC AND ZINC BASE ALLOY**	**520,501**
	FOR SALE	322,845
	FOR OWN USE	197,656

DIE 513,945
For sale 317,606
For own use 196,339

ALL OTHER 6,556
For sale 5,239
For own use 1,317

TOTAL	**MAGNESIUM AND MAGNESIUM-BASE ALLOY**	**25,777**
	FOR SALE	22,950
	FOR OWN USE	2,827

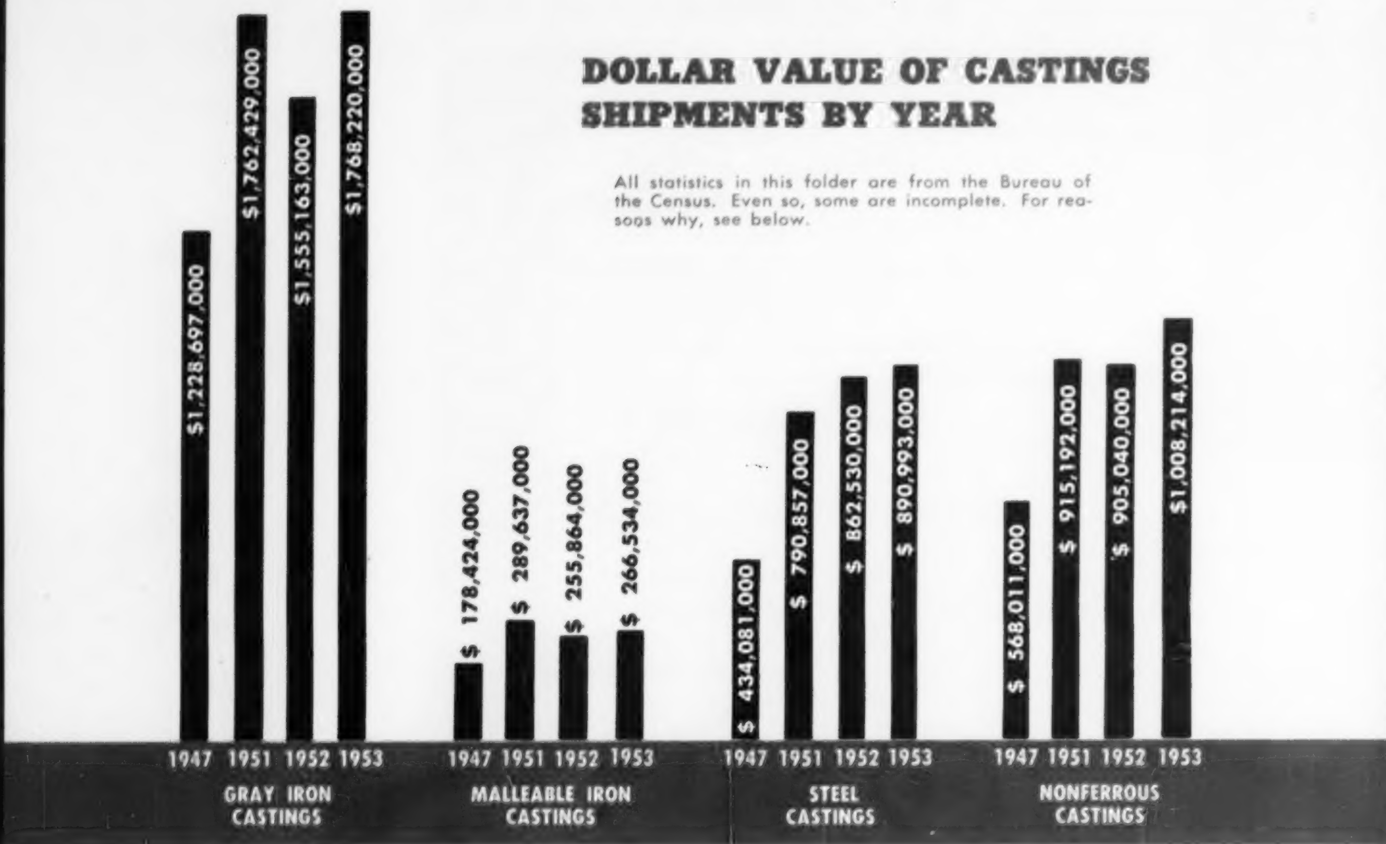
Sand 16,277
Permanent mold 4,672
Die and all other 4,828

TOTAL	**LEAD AND LEAD-BASE ALLOY DIE**	**18,396**
	FOR SALE	9,759
	FOR OWN USE	8,637

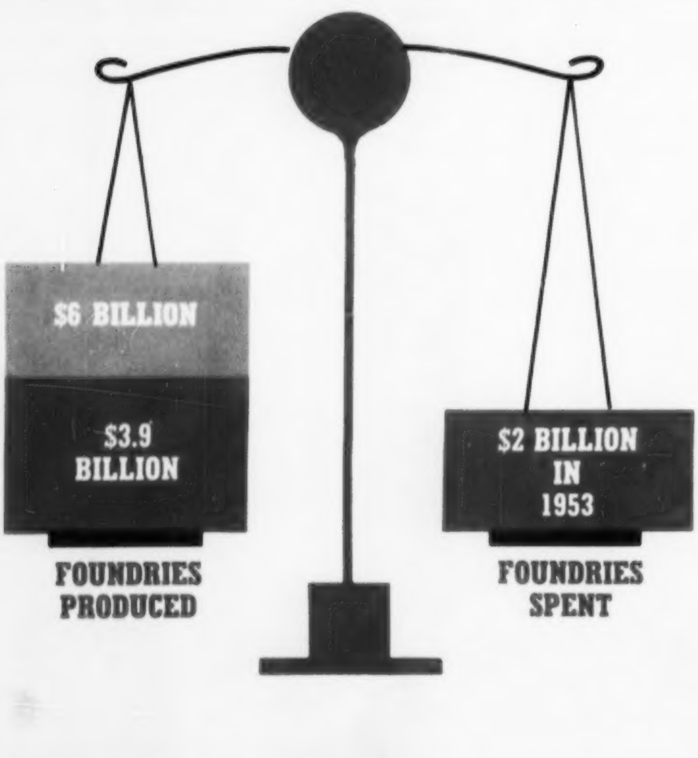
[1] Includes small quantities of "All other aluminum" castings shipped for sale.

DOLLAR VALUE OF CASTINGS SHIPMENTS BY YEAR

All statistics in this folder are from the Bureau of the Census. Even so, some are incomplete. For reasons why, see below.



THE TOTAL VALUE OF CASTINGS SHIPMENTS ALONE IN 1953 WAS . . . $3.9 BILLION

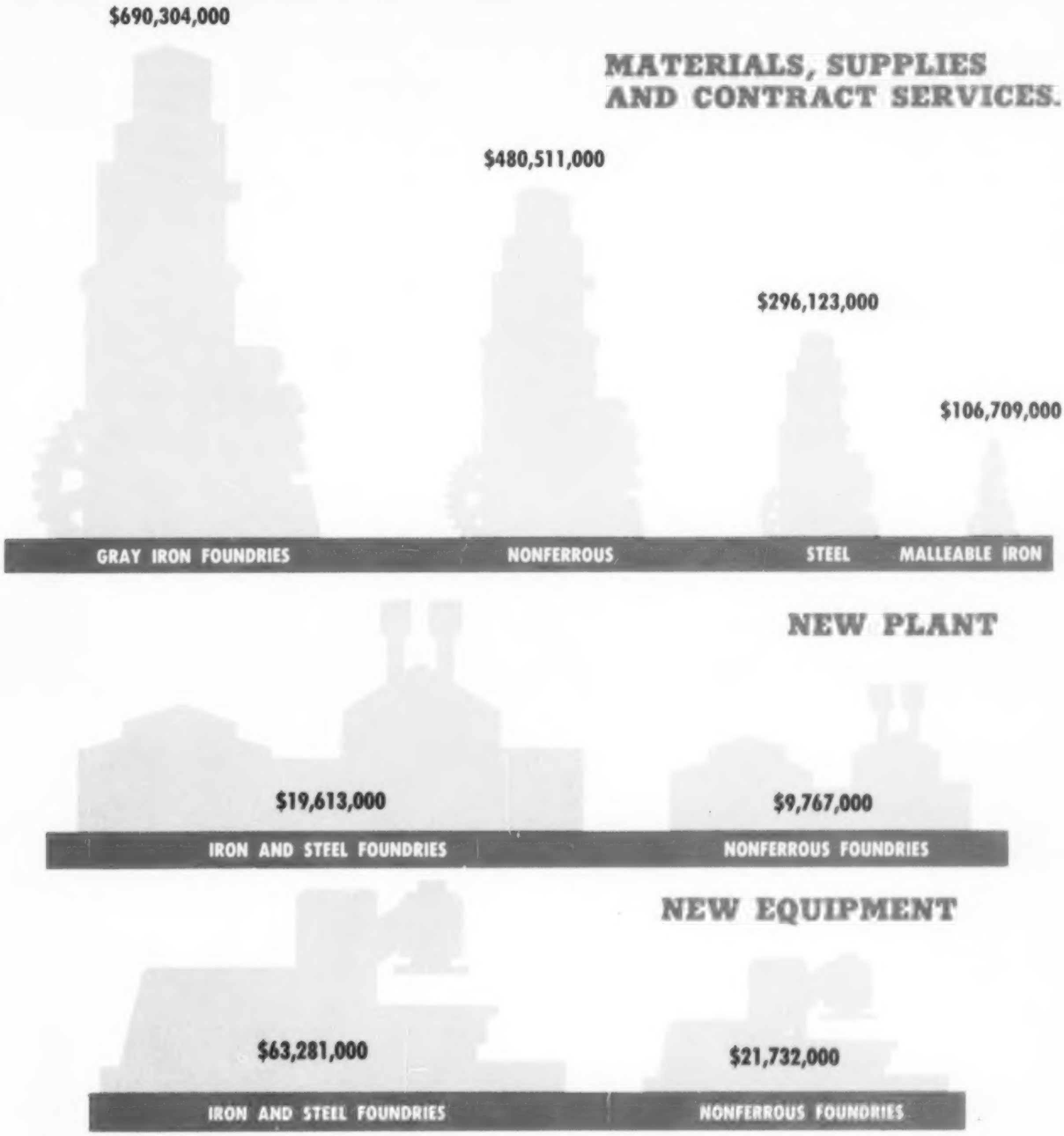


The Census reports **dollar** figures only for **shipments** of castings. Such dollar figures do not show the value of castings consumed within castings plants nor the large amount of captive production which is incorporated as parts and components of other products manufactured within the same establishment. As a result, these figures **greatly understate** the total value of castings production. Therefore . . .

MODERN CASTINGS AND AMERICAN FOUNDRYMAN ESTIMATE TOTAL VALUE OF ALL CASTINGS PRODUCTION AT

$6 BILLION . . .

HERE ARE KNOWN EXPENDITURES FOR THIS PARTIAL MARKET IN 1953



The **known** figures given above total **$1,688,040,000!** But even this tremendous total is incomplete because it covers only those establishments whose **primary** business is metal casting. The figures omit, therefore, hundreds of plants producing castings for their own use. Thus it is certain that annual expenditures by the castings industry are . . .

OVER $2 BILLION

Another fact we've been able to dig out is that **total** inventories of materials, fuels and supplies carried by foundries at any one time are about $200 million.

MAJOR PURCHASES OF

INDUSTRY FROM WHICH PURCHASES WERE MADE	PURCHASES IN DOLLARS BY . . . . IRON FOUNDRIES	STEEL FOUNDRIES	NONFERROUS FOUNDRIES	TOTAL PURCHASES
Iron ore mining		174,679		174,679
Coal mining	5,074,887	1,977,683	690,614	7,743,184
Stone, sand, clay, natural abrasives	12,048,096	5,221,284	2,270,792	19,540,172
Other non-metallic minerals	1,136,453	557,165	84,612	1,778,230
Grain mills products	2,660,189	2,139,311	514,530	5,314,030
Miscellaneous food products	192,583			192,583
Sawmills, planing and veneer mills	3,210,427	1,818,063	2,971,697	8,000,187
Fabricated wood products	25,396	20,078	3,430	48,904
Wood containers and cooperage		1,885,324		1,885,324
Printing and publishing		2,192,518	2,093,565	4,286,083
Industrial inorganic chemicals	664,518	214,835	1,404,095	2,283,448
Paint and allied products	662,402	245,956		908,358
Gum and wood chemicals		725,820	472,224	1,198,044
Miscellaneous chemical industries	13,038,524	11,317,969	5,383,127	29,739,620
Petroleum products	5,125,679	9,623,385	4,561,023	19,310,087
Coke and products	40,749,357	924,592	1,112,528	42,786,477
Miscellaneous rubber products	2,649,608	1,090,235	2,121,007	5,860,850
Structural clay products	5,036,794	2,018,843	1,324,057	8,379,694
Concrete and plaster products	2,308,883	920,576		3,229,459
Abrasive products	11,133,854	11,170,395	5,426,576	27,730,825
Other miscellaneous non-metallic minerals	7,565,772	4,295,688	1,477,273	13,338,733
Blast furnaces	249,937,146	27,726,714	5,365,976	283,029,836
Steel works and rolling mills	89,654,933	75,826,575	40,272,835	205,754,343
Iron foundries	2,844,307	70,376,402	33,159,743	106,380,452
Steel foundries	29,188,010	6,744,200	9,251,249	45,183,459
Primary copper	160,839	51,199	3,890,990	4,103,028
Copper rolling and drawing	18,695,394	5,939,072	8,158,159	32,792,625
Primary lead	8,598,527	2,731,612	4,267,169	15,597,308
Primary zinc			60,605,917	60,605,917
Primary metals n.e.c.	4,171,227	2,338,083	3,887,560	10,396,870
Nonferrous metal rolling n.e.c.	1,612,621	511,989	704,334	2,828,944
Primary aluminum	3,519,407	171,667	4,100,500	7,791,574
Aluminum rolling and drawing	5,102,399	1,621,299	2,226,200	8,949,898
Secondary nonferrous metals	16,316,673	2,807,908	125,720,260	144,844,841
Nonferrous foundries	10,458,755	6,041,470	9,431,907	25,932,132
Iron and steel forgings	7,610,215	2,266,806	3,107,761	12,984,782
Tools and general hardware	956,568	319,240	1,149,117	2,424,925
Metal plumbing and vitreous fixtures	11,047,086			11,047,086
Heating equipment	9,667,258			9,667,258
Structural metal products	9,567,792			9,567,792

DIRECT PURCHASES OF FOUNDRIES IN 1953!

The accompanying tables show the dollar volume of purchases by foundries in 78 different industrial categories. The column on the left shows the industry from which the purchases were made. The figures do not show the specific products purchased, though this can be deduced in most cases. For a full explanation of how these figures were derived, see back cover.

FOUNDRIES IN 1953

INDUSTRY FROM WHICH PURCHASES WERE MADE	PURCHASES IN DOLLARS BY . . . . IRON FOUNDRIES	STEEL FOUNDRIES	NONFERROUS FOUNDRIES	TOTAL PURCHASES
Lighting fixtures	4,143,715			4,143,715
Fabricated wire products	2,761,772	2,007,800	936,445	5,706,017
Steam engines and turbines			3,066,599	3,066,599
Internal combustion engines		279,084	35,445	314,529
Farm and industrial tractors	16,280,696	204,796	561,409	17,046,901
Machine tools and metalworking machinery	6,818,719	5,481,294	1,511,575	13,811,588
Cutting tools, jigs and fixtures			12,007,987	12,007,987
Special industrial machinery	9,743,445	12,506,586	1,065,649	23,315,680
Pumps and compressors	4,031,552			4,031,552
Power transmission equipment	3,953,248			3,953,248
Industrial machinery n.e.c.	1,726,901	1,270,937	1,242,876	4,240,714
Valves and fittings		403,568	614,006	1,017,574
Wiring devices and graphite products	8,348,804	3,821,847	1,676,224	13,846,875
Electrical measuring instruments		332,291	335,016	667,307
Radio and related products			440,209	440,209
Motor vehicles			1,872,889	1,872,889
Locomotives		1,311,093		1,311,093
Railroad equipment		820,186		820,186
Plastic products			340,733	340,733
Miscellaneous manufactured products	518,494	192,749		711,243
Electric light and power	20,193,735	23,644,857	8,191,318	52,029,910
Gas	3,885,527	5,024,520	3,594,850	12,504,897
Railroads	51,595,394	16,393,687	12,728,329	80,717,410
Trucking	12,708,382	3,457,432	2,728,152	18,893,966
Warehousing and storage	82,536	59,230	29,728	171,494
Water transportation	1,904,670	985,830	683,753	3,574,253
Air transportation	16,930	10,039	37,732	64,701
Pipeline transportation	40,210	80,312	44,593	165,115
Wholesale trade	38,182,285	24,676,866	21,168,908	84,028,059
Retail trade	167,188	100,390	100,619	368,197
Telephone and telegraph	3,110,961	2,477,625	2,540,635	8,129,221
Banking, finance and insurance	12,640,660	6,157,923	5,201,327	23,999,910
Real estate and rentals	4,473,858	2,330,052	7,369,213	14,173,123
Advertising	6,003,943	2,621,183	570,557	9,195,683
Business services	1,832,716	1,161,512	1,042,781	4,037,009
Automobile repair services and garages	1,572,411	513,997	822,105	2,908,513
Other repair services	3,117,310	1,625,314	937,588	5,680,212
Medical, dental and other professional services	4,550,045	2,113,210	2,135,871	8,799,126
TOTAL	816,798,686	386,074,845	442,845,948	1,645,719,479

TOMORROW . . .
Will Foundrymen PUSH a BUTTON?

▪ *On May 9, 1946, Fred J. Walls of International Nickel Co., Inc., then president of the American Foundrymen's Society (it was called AFA in those days), made what was considered to be a series of startling predictions.*

Walls said:

"Although they might now seem fantastic, gasless cores and molds, waterless binders, fireless melting units, castings that require no cleaning and with dimensional tolerances, all appear possible."

In less than 10 years all of Walls' prophecies have been more than fulfilled. Last May 25, in the Charles Edgar Hoyt Annual Lecture at the AFS annual convention in Houston, Walls took a long look at tomorrow's foundry. Following is a condensation of what he said.

■ So far as I know there are no architectural drawings for the foundries of 1960 or 1970 nor are any statistics available.

I would like to think of our future foundries as casting plants or casting shops to avoid the misconception too many people still have of our industry.

In all probability, most of the plants will not look much different from the outside than they do today. Some, no doubt, will take on the so-called "futuristic" appearance of our newer buildings, surrounded by landscaping and

Fred J. Walls

free from smoke, noise and odors.

On the inside there will be many changes in all departments, particularly in materials handling which involves liquids, solids and gases. To complicate matters, a large portion of these must be handled at elevated temperatures. It has been estimated that upwards of 200 tons are handled to produce one ton of finished castings varying, of course, with the product.

I do not know of any figures showing the horsepower or human power used in producing a ton of castings but by using the engineering formula of one horsepower to equal the steady work of 20 men, it is not difficult to foresee that there will be more "horses" and fewer men.

In our castings industry today I would guess that we spend about 30 per cent on an average of our total labor costs just in handling materials. Only a small portion of this is in handling the metals contained in the product. Most is in handling the indirect materials that enter into the process.

When I went to school I was taught that the source of all energy was the sun's rays, exemplified in the muscular energy of humans and animals, in flowing water, in burning fuel, and in moving air. But with the more recent discovery of the energy of the atom and its control by our scientists, we can no doubt look forward to its applications in the casting industry.

Most of the work done in the handling of materials is required to overcome the force of gravity. For this reason I don't think it is too far fetched to suggest that the future engineers might design the handling systems first and then build the processes and plant into and around the system, thereby letting old man gravity help reduce production costs.

▪ **Materials.** There is no doubt in my mind but that our future materials will be different and with less of them required. During the past few years we have witnessed great progress in the field of core and mold binders. Resins, organic polymers and other organic compounds are now in considerable usage. There are great possibilities in the inorganic polymers as well as in combinations of the organic and inorganic compounds not the least of which are the silicones. Gaseous binders are within the realm of possibilities. We already have the carbon dioxide process.

The tremendous strides being made in ceramics, cermets and other high temperature refractories lends confidence that they will shortly find their way out of specialty fields into the general castings industry.

Further improvements in the blending and preparation of natural sands can be anticipated as molding and coremaking methods change and as more of the science of heat flow is applied.

▪ **Equipment and processes.** Management in the castings industry has been fortunate over the years in having had available talented specialists in all branches of engineering through the progressive equipment manufacturers and material suppliers. They have designed standard equipment and special equipment to meet specific requirements.

However, equipment must be coordinated and synchronized in order to provide the greatest efficien-

HOW THE RESEARCH DEPARTMENT OF MODERN CASTINGS PREPARED THIS DATA . . .

There has long been a need among manufacturers and producers supplying the foundry industry for complete figures on the size of the market. Even the Census data has been incomplete. The annual Survey data has provided a total figure but no breakdown.

An important attempt to produce such information was made by the Division of Interindustry Economics' Study of Interindustry Relations for 1947, which is a comprehensive analysis of the transactions relations among the separate industries of the United States for that Census year. So complex was the study that the results were not available until June, 1953.

One result, in the case of foundries, was a series of ratios giving the purchases of iron foundries, steel foundries and nonferrous foundries in terms of dollar output. Thus, in the case of iron foundries, the study reported that purchases from the coal mining industry were $2,398 per million dollars of output. In the case of steel foundries, the figure was $1,970 and for nonferrous foundries was $604.

Once such figures were established, the problem was simply one of extending them in terms of the dollar output of the foundry industries for the latest available year. The year 1953 was chosen because more information was available on it than for 1954.

Even so, complete dollar output of the foundry industries can be only an estimate since Government figures cover only the dollar output of *shipments*. In projecting the 1947 ratios to 1953, therefore, it was necessary to develop careful estimates of total dollar output based upon various factors including shipments, 1947 gross domestic output extensions, and other factors. It is significant that the total of the separate figures we have developed in this way – $1,645,719,479 – is within 2½% of the Federal Government's own estimate of total expenditures by foundries for the same year of 1953.

LIMITATIONS OF THIS DATA . . .

Nevertheless, the figures have limitations. Since they are based upon 1947 ratios, for example, they are bound to understate industrial purchases in growth sectors and to overstate them in stable or declining sectors of the foundry supply field. However, it should be noted that equivalent information based upon the 1954 Census of Manufacturers will not be available for several years.

The study also assumes that price relationships of all foundry supplies have increased at the same rate since 1947. While this is obviously not true, we believe that the figures given here are more than indicative and undoubtedly the best available at this time.

The study does not list dollar figures for specific products but only purchases from the entire industry sector in question. In many cases the specific product can be determined; in others it cannot.

The total market is understated for two reasons:

1. It does not include the Canadian market which is a large and growing area for foundry suppliers of both countries.

2. The U.S. Census data from which the figures are derived omits the many captive foundries not defined as separate "establishments." The projections do include, however, both foundry products which are shipped and those which are consumed within those plants listed as "establishments."

These omissions indicate that total purchases by foundries in the United States and Canada undoubtedly exceed $2 billion annually.

THE AMERICAN FOUNDRYMEN'S SOCIETY
Golf & Wolf Roads, Des Plaines, Illinois
VAnderbilt 4-0181

cy. It is in this respect that the trained engineer can be of the most service. The introduction of automation in the past few years has had a good reception. Pushbutton molding machines and core making machines are here to stay and no doubt can be expected to expand to many applications.

Developments in machines and techniques have made possible the blowing of green sand molds.

Diaphragm molding will probably exceed all expectations a few years hence. This type of molding is a forward step in eliminating noise and vibration fatigue causes in casting plants. Advances in the shell molding process have been phenomenal and present researchers will have many new discoveries for release in the near future.

▪ **Materials handling.** The magnitude of foundry materials handling problems can be explained best by estimating tonnages handled during the past three years. Total castings produced, ferrous and nonferrous, during 1952, 1953 and 1954 was 48,601,363 net tons or an average of 16.2 million tons per year.

If we assume we handle only 100 tons of materials to produce one ton of saleable castings, that means we handled 1.62 billion tons of materials per year. If these figures sound unreasonable, just take some time to follow how many times you handle the sand required to make a ton of saleable castings from the point where it enters your plant until it is made ready for the next ton of castings. And if you are operating a cupola, don't forget it takes a long ton of air to melt a short ton of iron. In many cases the air is again handled on the way out, because of smoke and dust ordnances.

Incidentally, the consumption of castings for every person in the United States averaged 203 pounds per year for the period mentioned. By 1970, foundries will be producing castings at the rate of about 25 million tons per year.

While all of these developments trend toward the elimination of human horsepower, none of them reduces mental effort. As a matter of fact they increase the demands for mental effort. It is simple to measure human effort in terms of mechanics but impossible to measure mental effort in terms of any known standard. What we need most in any industry, and particularly in the castings industry, is mental work. To obtain this we must have people with a capacity for doing mental work.

Let me emphasize, too, that the engineering of human behavior requires far more thought and consideration than has been demonstrated in many instances in the past. In our struggles for economic supremacy through mechanization, we must not forget that the "pride of accomplishment" in all individuals inspires them to greater endeavors.

▪ **Metallurgy.** Only a few years ago, metallurgy was thought of as the art and science of separating metals from their ores as found in nature. Now we think of it as a science embracing, in addition, the refining, alloying, shaping and treating of metals to produce commercial articles with optimum mechanical and physical properties.

As such, it embraces all the basic engineering sciences and every foundry becomes a laboratory wherein the knowledge of the laws of chemistry, physics, thermodynamics, hydraulics, etc., govern the quality of its output.

Even now the nuclear physicist has his foot in the door and there is every reason to believe that he will come up with the solution to many of our perplexing problems.

The casting process is the shortest path between nature and a useable product and along this path nearly all metals must travel before they can be fabricated and become useful.

In 1937, Dr. P. D. Merica, in his Howe Memorial Lecture, dubbed cast iron the "Cinderella" of materials. It is more so today because during that short space of 11 years it was discovered how to control the shape of the carbon so as to impart ductility to a family of alloys that had always been considered brittle. Today we know how and tomorrow our scientists will tell us why the carbon takes the shape of a sphere.

At present about 80 per cent of the total tonnage of all castings made falls into the gray iron families because of versatility and economics. Although the future of the gray iron industry appears bright I would like to cite a pessimistic note.

If the automotive industry follows the trends in the aviation industry, and I think it will, then we can look for "pin wheel" engines to replace piston engines in the not too distant future.

When this happens, a lot of gray iron castings will be discontinued and will be replaced by alloys more suitable in mechanical properties at elevated temperatures. These alloys will be cast by improved melting and molding methods.

The metallurgy of these high temperature alloys has been one of make and test. More recently the application of vacuum melting has shown the way for obtaining much better properties and a higher degree of certainty in duplicating them.

Dr. T. Keith Glennan, president of Case Institute of Technology, speaking before the annual Foundry Educational Foundation conference banquet earlier this year, said that "recent information from Germany indicated that a 150-ton vacuum casting was made and, while this may still be considered experimental, it points the way to the future."

With the unquestionable advent of the gas turbine in automobiles and other applications, many of the parts will be made as castings and both metallurgical and dimensional tolerances will necessarily be held closer than at present. To do this will require further developments in investment casting, shell molding, frozen mercury patterns and probably new methods not yet disclosed.

Titanium, not yet out of the research stages so far as methods of fabrication and uses are concerned, no doubt will add to the possibilities in the castings industry. New developments in the copper-base, the aluminum-base and the magnesium-base alloys will enhance their uses as castings in many fields.

Pearlitic malleable, special purpose high alloy cast steels, and ductile iron all add encouragement to the castings industry.

Besides, we can look forward to many unknown combinations of elements in the future because the scientists have provided the metallurgist with new tools that tell him the how, the what and the why of metal behaviors. These tools have become well established in research laboratories and in many of our more progressive casting plants. To name some: the spectrograph, the electron microscope, the x-ray, radioactive cobalt 60 and tracer elements, the Geiger counter, residual stress analysis equipment, electronic gadgets, etc.

▪ **Future foundrymen.** Future foundrymen will have at their command new technological developments and of necessity they must have education in the sciences governing these developments. Nevertheless, we must look upon skill and science as a happy union and avoid some of the attempts to divorce them.

There is danger ahead if we drift too far in one direction, for no gear or even an electronic gadget has yet been developed that can be substituted for brains when something goes wrong.

AFS Group Assigns CO_2 Study

CO_2 process and the core shooting machine will be studied by Core Test Committee of the American Foundrymen's Society's Sand Division. This assignment was made at a meeting of the division's Executive Committee in Chicago, September 16.

On the previous day, the Sand Division Program & Papers Committee met and acted to absorb the Shop Course Committee. Shop course programming will now be handled by a vice-chairman of the program and papers group.

Fourteen possible papers were discussed as presentations for the AFS Castings Congress. Some of the subjects were: Pennsylvania State College research on interaction of metal and sand, development of a new sand classification number, ceramic molds, mulling and green sand properties, green sand casting finish, flowability, and moisture and bakeability of cores.

The Executive Committee heard a reort that the Grading, Fineness & Distribution Committee will soon release their recommendations on a standard glass bead test for checking sand test sieves.

■ Any improvement in metallurgical coke quality that allows less of it to be used certainly reduces cupola melting costs. But, probably of even more importance to the cupola operator are higher temperatures and greater carbon pickup.

Fuel savings for large foundries melting 1000 tons/day and upwards become quite important and a difference of 10¢/ton of iron cannot be ignored. The table shows the amount of $30/ton coke consumed per ton of iron melted at three iron/coke ratios.

Control of carbon pickup is particularly important in making irons

COKE CONSUMED AT $30/TON

Iron/Coke Ratio	$Coke/Ton Iron
6:1	$5.00
8:1	$3.75
10:1	$3.00

to certain strength specifications. Within the normal gray iron composition range, a 0.10 per cent increase in carbon content results in a decrease of about 2300 psi tensile. High carbons—low strengths; low carbons—shrinks and hardness.

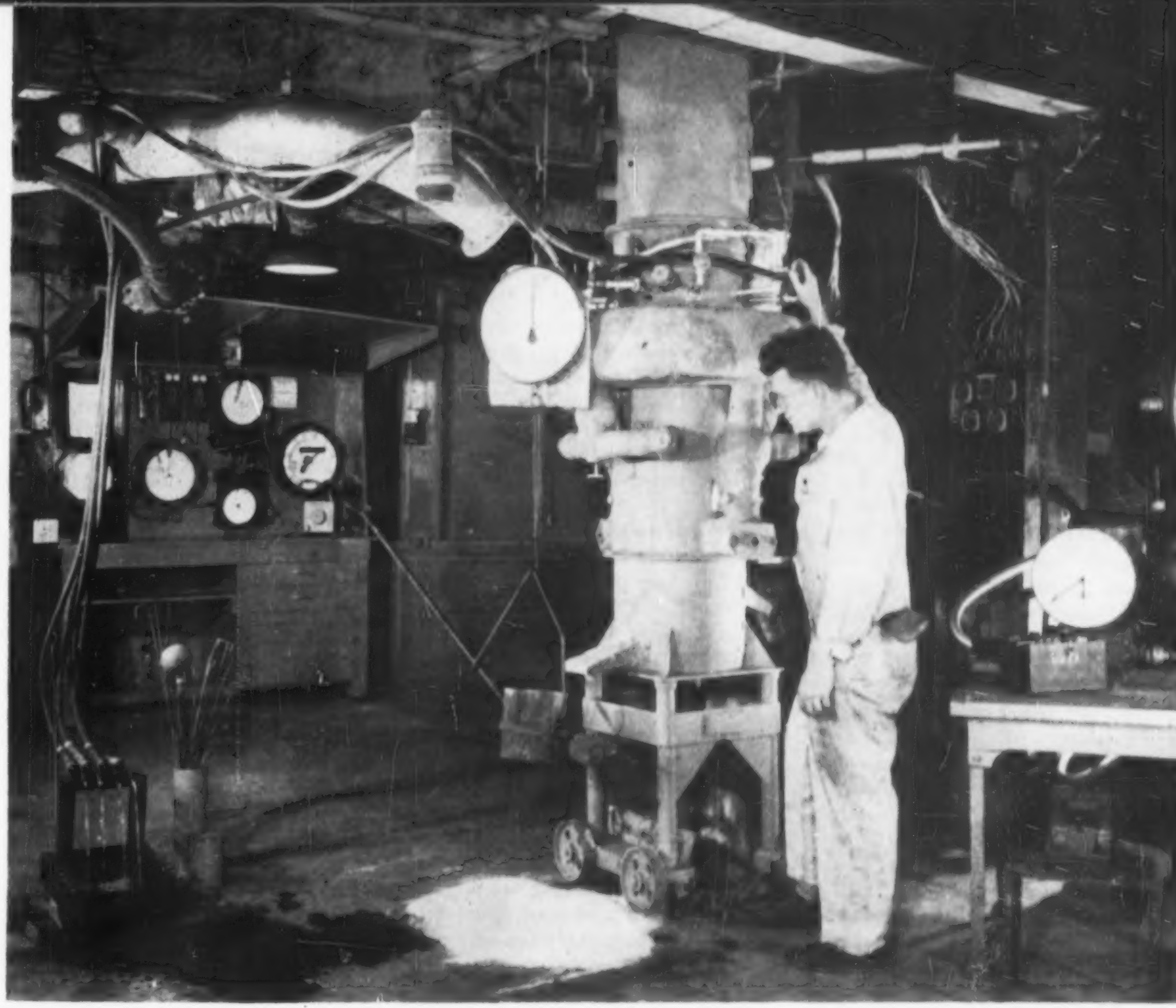
If iron temperatures drop, misruns and blows result, where as increased temperatures court burn-in. Then too, temperatures influence carbon pick-up.

At present, coke temperature characteristics are reasonably good, but carbon pickup is not always predictable. Foundries making high-strength irons often decrease the coke charge to get the desired decrease in carbon content, only to make the cupola sensitive to certain variations in operating conditions.

Laboratory tests. What the cupola operator needs is a coke characteristics index which would enable him to predict its behavior in the cupola.

At least one producer supplying coke for a certain type of cupola operation has reasonably good success with just such an index arrived at by actual test in a small cupola at the coke plant.

If it is not feasible for the producer to supply a cupola-test index, a laboratory test should be developed that will allow the cupola operator to quickly predict coke behavior. Because it is difficult and sometimes almost impossible for



WHAT do we know about Coke?

Cupola operators need a coke characteristics index to predict melting performance

D. E. KRAUSE/*Executive Director*
Gray Iron Research Institute, Inc.

the foundry to obtain a sample of coke representative of a car or shipment, it seems preferable for the coke producer to make the test.

The coke sample for laboratory tests conducted by the staff of the Gray Iron Research Institute consists of about 10 pieces, showing both the wall and seam ends, selected from various positions in the car or pile. Unusually short, long, or large pieces are avoided.

The importance of various coke characteristics has not as yet been evaluated, but it appears that an index of quality must include evaluation of strength and burning properties.

Various tests, to be described, were performed on one or two samples to as many as 20 samples from each of 18 producers. In some cases, information enabling correlation of coke properties with cupola operation was not available. In the majority of cases, performance of the coke in the commercial cupola operation was based on the opinion of the cupola operator.

Laboratory tests include combustion tests, proximate analysis, physical tests, and small cupola tests. Tests were usually performed on a two-inch slice, cut from the lump of coke midway between the wall end and the seam end and parallel to the wall end.

Combustion tests of reactivity with a finely ground coke sample were dropped when the Boegehold combustibility test with 8-mesh coke proved to be quicker, yet give similar results. In the Boegehold test, a one-gram sample of coke is heated at a predetermined rate in a

controlled flow of oxygen until the coke ignites. Ignition temperatures varied from 850 to 1100 F.

When it was found that specimens taken from a crushed entire lump gave erratic results, especially if the seam-end volatile content was high, the described practice for obtaining specimens was adopted. Although there may be objections to this method from the standpoint of obtaining a representative sample, it nevertheless gave more useful results.

In relation to performance in the commercial cupola, cokes with ignition temperatures above 1000 F were always considered good; however, some good cokes had lower ignition temperatures. It was also determined that a higher strength coke can have a lower ignition temperature than a lower strength coke and still be considered good.

Ignition temerature decreases very rapidly with an increase of volatile matter from 0.4 to about 0.7 per cent; further increase in volatile decreases ignition, but at a slower rate.

Physical tests. Although no systematic investigation of the influence of screen size distribution of coke on its commercial performance was made, it has been found advantageous to screen out all minus two-inch coke.

No relationship was found between density and cupola performance.

An attempt to relate apparent specific gravity of the coke with cupola operation met with little success.

No shatter tests were performed, although it is felt that this test might be one of the more useful tests because the coke can be tested as received, and the test simulates, to some extent, treatment coke is subjected to. Also, since strength and combustion properties seem to be related, coke stability by the shatter test may be an indirect measure of its combustion behavior in the cupola.

Because of the wide scatter in compression test results, it was found desirable to test at least 20 specimens from a sample of coke. The adopted test specimen was a one-inch cube cut from lumps midway between wall and seam ends with a masonry abrasive saw using a silicon-carbide wheel and water. Cubes were dried at 220 F before testing.

Results of compression tests on high strength coke were more scattered than for low or medium strength coke. This is at least partly attributed to fissures or cracks in high strength coke.

Only two cokes with compressive strengths above 1800 psi were rated poor by the cupola operators, and these had over 1.0 per cent volatile matter. Average coke strengths varied from 1160 to 3670 psi, however, individual specimens reached 4500 psi.

Apparently there is no relationship between compressive strength and ash contents from 5.1 to 10.5 per cent.

Compressive strength increases fairly well with density (calculated from one-inch cubes).

An indication of coke strength is apparent while cutting specimen cubes; higher strength coke produces specimens with sharper edges.

Proximate analysis of specimens from midway between the lump wall end and seam end, showed volatile matter varying from 0.35 to 2.30 per cent and ash from 5.1 to 10.5 per cent. Sulphur was not determined as contents reported by the producer were considered satisfactory. Volatile and ash are probably the two factors in proximate analysis of greatest interest to cupola operators.

Small cupola tests on coke were run in the Battelle Memorial Institute 10-in. diameter cupola which was designed by the Gray Iron Research Institute. More than 200 heats were run over a period of several years.

On several occasions, samples of good and bad performance commercial coke were crushed to suitable size and tested in the 10-in cupola under controlled conditions. The difference in tapping temperatures of the two cokes was just about the same as for the commercial operation.

The principal objection to cupolas of less than about 27 in. diameter is the need for specially sized materials and the cost of running the test. A 36-in. cupola would be more suitable. Yet, although this test can not be considered feasible for the average foundry, from the standpoint of coke evaluation reliability, the small cupola test is probably better than any other laboratory test.

Production performance. The real criterion of coke quality is its performance in a commerical cupola operation. However, normal variations in cupola operation often make it impossible to detect minor changes in coke quality and sometimes even fairly large changes in quality are obscured. Since some cupola operators are after high melting rates, others, high carbon pickup, high temperature, or low operating blast pressure, it is often difficult to reconcile their classification of poor and good with measurable coke properties.

Irregularly sized and large pieces in the metal charge may influence the distribution of coke so that an otherwise good coke may give unsatisfactory performance. Erratic and unpredictable material distribution is the result of some types of charging equipment that do not handle all materials equally well.

Since iron temperature is one of the more revealing factors of coke characteristics, it is important that accurate temperature measurements be taken frequently. Unfortunately, commercial operating data are not always dependable in this regard.

Analysis of stack gases at specific locations in the cupola with hand operated equipment often discloses nonuniform combustion conditions, probably resulting from improper coke distribution. It is practically impossible, however, to follow combustion conditions with hand equipment, and even automatic analyzers of the Orsat or chemical absorption type are too slow, having around a 2½-min cycle. In addition, dirt in the stack gases clogs the lines and filters making the equipment unsatisfactory for control work.

Not long ago an analyzer was purchased which has proven to be quite satisfactory. It responds to a change in analysis within 10 sec and is capable of sampling up to four points in the stack on a 5-min cycle. It reaches a balanced condition within 20 sec after a sample point is switched.

Samples taken 9 ft above the tuyeres of a cupola charged by equipment that tended to place more coke under the charge door than on the opposite side, showed CO or combustible content to be about 25 per cent under the door (present limit of analyzer) and often less than 10 per cent on the opposite side.

Automatic and even hand sampling on another cupola charged by cone-bottom buckets which had been loaded from one side, indicated that there was a tendency for more coke to be at one position than at the opposite. Logs of six consecutive heats on this cupola show no predictable pattern of combustion conditions. This is why it is difficult to evaluate with certainty properties of foundry coke.

Future work. Because it is difficult to correlate cupola operator opinions with coke properties, more careful and thorough data are needed. Since some of the gas sampling problems have recently been solved, the coke evaluation program should proceed rapidly.

Samples of 10 consecutive shipments of coke from one producer to one plant have been obtained together with very complete (except gas analysis) operating data over a period of several months. This coke will be subjected to various laboratory tests to determine what correlations can be set up.

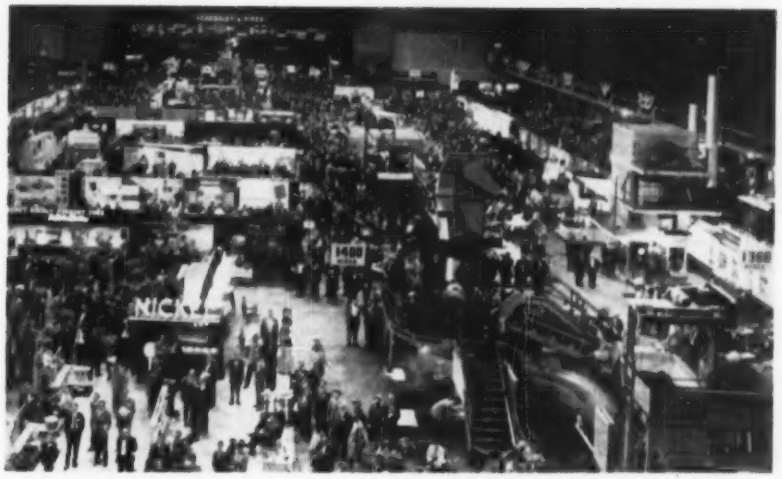
Experience shows that one producer makes coke having properties within a certain range while another's coke is in another range.

Certain foundries are now withholding two-ton samples of some of these cokes and are submitting 25-lb samples to the Institute for preliminary testing. If properties are in a desired range, the two-ton lots will be tested in a 32-in. cupola equipped with necessary controls for accurate evaluation.

Plans are to run combustion tests on one-inch cubes of coke in a 6-in. diameter cylindrical furnace. Ignition temperature, combustion temperature, burning rate, and composition of gases will be determined.

Some day, coke specifications will be established which the producers can meet and which will indicate coke perfomance.

Condensed from a talk before a meeting of the American Coke & Coal Chemicals Institute.



Manufacturers Make Heavy Demands For AFS Casting Congress Exhibit Space

■ Less than 25 per cent of the floor space for the 1956 Castings Congress and Exhibit remained available for exhibitors with the date for official assignment of space still 30 days away.

William N. Davis, exhibits manager of American Foundrymen's Society, has announced that applications already have been received from 162 exhibitors desiring to display at the 60th annual Congress which will be held May 3 to 9, 1956, in Atlantic City, N. J.

The tentative program for the technical side of the AFS Congress has been announced and was published in the November issue of MODERN CASTINGS. The program includes 27 technical sessions. Two technical papers will be scheduled for presentation at each of the sessions.

In addition, there will be nine informal round table sessions and six evening shop courses.

Tentative subjects of papers on refractories include air furnace refractories, electric furnace refractories, gun placement of cupola refractories and refractory consumption.

Quality control, incentives and human relations will be the subject matter of papers being considered by the industrial engineering and costs group.

The AFS Safety, Hygiene, and Air Pollution Control Committee has announced that it will present case histories of noise abatement and demonstrations of the causes and cures for harmful noise in the foundry.

Exhibtors whose applications for floor space have been received are:

Acme Resin Corp.
Air Reduction Sales Co.
Ajax Electrothermic Corp.
Allen Industrial Products.
American Air Filter Co.
American Alloys Corp.
American Colloid Co.
American Gas Association.
American Metal Market.
American Refractories & Crucible Corp.
Apex Smelting Corp.
Arcair Co.
Archer-Daniels-Midland Co.
Arrow Pattern & Engineering Co.
Austin-Western Co.
Ayers Mineral Co.
Baird Associates.
Baroid Sales Div., National Lead Co.
Barrett Div., Allied Chemical & Dye Corp.
C. O. Bartlett & Snow Co.
Beardsley & Piper Div., Pettibone Mulliken Corp.
Beryllium Corp.
Black, Sivalls & Bryson.
Borden Co., Chemical Div.
Brush Beryllium Co.
Canton Chaplet & Mfg. Co.
Carrier Conveyor Corp.
Carver Foundry Products Co.
Centrifugal Castings Machine Co.
Clearfield Machine Co.
Cleco Div., Reed Roller Bit Co.
Cleveland Flux Co.
Cleveland Metal Abrasive Co.
Cleveland Vibrator Co.
Climax Molybdenum Co.
Colonial Metals Co.
Corn Products Sales Co.
Davenport Machine and Foundry Co.
Davey Compressor Co.
Dayton Oil Co.
Debevoise-Anderson Co.
Delta Oil Products Co.
Detroit Electric Furnace Div., Kuhlman Electric Co.
Harry W. Dietert Co.
Joseph Dixon Crucible Co.
Durez Plastics Div., Hooker Electrochemical Co.
Eastern Clay Products Dept., International Minerals & Chem. Corp.
Eastman Kodak Co.
Eclipse Fuel Engineering Co.
ElectroRefractories & Abrasives Corp.
Exomet, Inc.
Fabreeka Products Co.
Fanner Mfg. Co.
Federal Foundry Supply Co.
Federated Metals Div., American Smelting & Refining Co.
Foundry.
Foundry Equipment Co.
Foundry Services.
Fox Grinders.
Freeman Supply Co.
General Electric Co., Chemical Materials Dept.
Globe Steel Abrasive Co.
A. P. Green Fire Brick Co.
Samuel Greenfield Co.
Grindle Corporation.
Harbison-Walker Refractories Co.
Benj. Harris & Co.
Harrison Machine Co.
Hayleo Controls Corp.
Herman Pneumatic Machine Co.
Hewitt-Robins, Inc.
Hickman, Williams & Co.
Hill & Griffith Co.
Hines Flask Co.
Frank G. Hough Co.
E. F. Houghton & Co.
Hydro-Blast Corp.
Ingersoll-Rand Co.
International Molding Machine Co.
International Nickel Co.
Jeffrey Mfg. Co.
Kindt-Collins Co.
King Tester Corp.
Lester B. Knight & Associates.
H. Kramer & Co.
Kwik-Mix Co.
Laboratory Equipment Corp.
Latrobe Steel Co.
Lava Crucible-Refractories Co.
R. Lavin & Sons.
Lindberg Engineering Co.
Link-Belt Co.
Magnaflux Corp.
Manley Sand Co.
Markal Co.
Martin Engineering Co.
Metallizing Co. of America
Mexico Refractories Co.
Mine Safety Appliances Co.
MODERN CASTINGS.
Modern Equipment Co.
Monsanto Chemical Co.
Moulders' Friend.
Nassau Smelting & Refining Co.
National Crucible Co.
National Engineering Co.
Newaygo Engineering Co.
Niagara Falls Smelting & Refining Co.
Wm. H. Nicholls Co.
Nichols Engineering & Research Corp.
Nomad Foundry Equipment Div.
S. Obermayer Co.
Ohio Crankshaft Co.
Ohio Ferro-Alloys Corp.
Oliver Machinery Co.
Orefraction, Inc.
Osborn Mfg. Co.
Pangborn Corp.
Penn-Rillton Co.
Pennsylvania Foundry Supply & Sand Co.
Penola Oil Co.
George F. Pettinos.
Pittsburgh Crushed Steel Co.
Pittsburgh Lectromelt Furnace Corp.
Planet Corp.
Pyrometer Instrument Co.
Redford Iron & Equipment Co.
Roessing Bronze Co.
Ross-Tacony Crucible Co.
Royer Foundry & Machine Co.
Claude B. Schneible Co.
A. Schrader's Son Div., Scovill Mfg.
Schramm, Inc.
Semet-Solvay Div., Allied Chemical & Dye Corp.
Shallway Corp.
Shell Process.
Shell-O-Matic.
Specialty Products Co. & Hickory Specialty Co.
Spencer Turbine Co.
SPO Incorporated.
Standard Electrical Tool Co.
Standard Horse Nail Corp.
Frederic B. Stevens.
Sutter Products Co.
Tabor Mfg. Co.
Technical Operations.
G. H. Tennant Co.
Thor Power Tool Co.
Union Carbide & Carbon Corp.
United Oil Mfg. Co.
United States Gypsum Co.
U. S. Reduction Co.
United States Rubber Co.
Vacu-Blast Co., Inc.
Vanadium Corp. of America.
Vesuvius Crucible Co.
Vibron Div., Burgess-Sterbentz Corp.
Weaver Block Co.
Westover Engineers.
Wheelabrator Corp.
Whitehead Bros., Co.
Whiting Corp.

What FOUNDRY MANAGEMENT Expects of Equipment Manufacturers

Here's what the manager of Ford foundries told the Foundry Equipment Manufacturers' Association

F. X. BUJOLD/*Manager of Foundries*
Ford Motor Co., Detroit

■ The future progress of the metal castings industry presents a real challenge for the equipment manufacturer to consider.

With the constant development of new melting, core making and molding techniques, many horizons have been opened. We will probably all agree that they have been sorely needed for many years.

The outlook for our industry has never been brighter, therefore, the potential for the equipment manufacturer is equally promising.

"What does foundry management expect of the foundry equipment manufacturer?"

▪ Foundry equipment is exposed to excessive amounts of sand, gases, heat and physical abuse. Machinery and equipment, therefore, must be protected from these harmful agents. A conservative factor of safety must be built into the design.

Most foundries tend to work equipment to the limit of its capacity. This becomes necessary as production demands rise. If a molding system was originally designed to produce 300 molds per hour, it might be redesigned, after installation, to produce 400 molds per hour.

Although this may be considered a fault by equipment suppliers, it is a fact. For this reason, the supplier should plan a safe margin in the original design of his equipment, and its maximum limitations should be clearly defined.

▪ Electrical control panels have often been a source of trouble due to fouling of contacts. It is encouraging to find that this problem is receiving increased attention and that panels are now being received with air-tight seals. Electrical control circuits can further be improved by using signal lights to locate trouble. It is becoming common practice, for example, to install signal lights on molding systems. When the line is stopped, the supervisor in that area knows where the trouble spot is. This simple expedient minimizes downtime.

▪ The design of all equipment should permit reasonable access for quick and easy maintenance with standard tools.

During a normal operating day, delays can be minimized if shear pins, relays, solenoid valves, and similar items can be reached and changed readily.

In the case of new equipment installations, additional safeguards are sometimes required. The design of these guards should be such that their presence does not handicap maintenance. An example of this

difficulty was encountered on one of our conveyor systems. A daily change of rubber bushings could not be made with a standard wrench until the equipment framework was altered. In order to avoid this type of trouble, closer adherence to National Safety Council requirements should be maintained.

■ Manufacturers' ingenuity must be directed along the lines of reducing human effort and improving working conditions. Although simple, your equipment must be capable of performing more operations automatically. This can most readily be accomplished by minimizing the number of moving parts. We are willing and anxious to give any information needed for such development.

Noise

■ Toward the end of improving working conditions, noise levels in the foundry must be reduced and ventilation must be improved. Progress has been slower in this area than any other since the mechanization of the industry began. For years, we have assumed that machines must make noise to do their job. As more machines have been added to the foundry, noise levels have constantly increased and, as more castings have been produced per unit area, ventilation has become an ever increasing problem.

Minimizing the number of moving parts is one good way to reduce noise levels, but we may have to go much further. In the molding operation alone many new concepts have been introduced. The shell process, squeezing molds without jolting, and the CO_2 process would all have a tendency to reduce noise levels.

In other areas, proper baffling is capable of reducing noise levels on shaker screens and vibrating conveyors.

Vibration suppressors or isolators can also be added to equipment foundations to reduce the transmission of objectionable noise to adjacent work areas.

■ Ventilation can be greatly improved by installing compensating hoods in immediate proximity to the source of nuisance generation.

The individual type of nuisance must be analyzed to obtain design data for proper hood velocities.

The emission temperature and presence of cross drafts must be surveyed in order to provide effective hood and shield designs.

It is important that an accurate balance be maintained between air discharged to the atmosphere and make-up air.

Automation

■ Since the foundry is primarily a material handling organization, the use of segmented automation and in-line operations must be more extensively explored. The areas which most urgently require improvement are: core setting, mold closing and clamping, iron pouring, cooling conveyors, casting knockouts, and casting finishing operations.

In other areas, much progress has been made. These serve as proof that the foundry has improved tremendously. They are: core making, melting, molding, sand control and casting shakeouts. Progress in these areas is far greater, and we can expect even greater strides to be made.

The machine tool builders have been particularly successful in applying automation to the machine shop. Is it unreasonable to expect that the same progress can be made in a foundry? Future progress in the machine shop is restricted by the quality of castings produced by the foundry. As new end products are designed, we will be expected to improve our castings. We must produce castings with thinner metal walls, with thinner cores and castings which are more accurate dimensionally. In order to accomplish these objectives, we will strive to reduce the personal element and find equipment which can perform operations in a more predictable manner.

Seller's Job

The equipment manufacturer must have a flexible organization which is capable of designing specialized handling equipment to supplement his standard products. If he designs a molding machine for example, he should also be in a position to design flask handling equipment and equipment for changing patterns. If he builds sand mixing equipment, he should be able to discuss the entire sand handling and control system.

■ The manufacturer must be willing to follow the application of his equipment in the field closely. Good customer service is the keynote to success in any business endeavor.

He will be expected to assume his share of responsibility during the initial operation of his equipment. With close cooperation during this period, more satisfactory results can be accomplished.

■ In addition to supplying what a buyer says he wants, it is felt that the seller also has an obligation to become informed concerning the requirements of his equipment so that he can help the buyer make certain that important details are not overlooked. Engineering specifications should be checked and inadequacies pointed out so that necessary changes can be made before they become costly. These items are especially important when designs are produced by the seller on the basis of specifications submitted by the buyer. It is also important that spare parts lists be prepared at an early date so that production will not be impaired later by slow service.

■ It is the supplier's responsibility to see to it that his customer is properly trained in the use and maintenance of his equipment. In many cases, it is desirable to send personnel to training schools. In all cases, operational and maintenance instructions should be submitted.

Whenever possible, the equipment manufacturer should submit a preventive maintenance program. In the light of your experience with the same or similar equipment used by customers, you can minimize maintenance costs by advising on the life expectancy of all moving parts of your equipment.

Those manufacturers, who have followed the progress of their equipment in the field closely, have found that they improve customer relations. They have also discovered many ways of improving their products. In this manner, they have increased their potential sales market.

■ A manufacturer does not always produce all of the component parts of a machine. Some of them are sub-contracted to other organizations, but it should be his responsibility to determine the proper use for these parts by consulting the respective sub-contractors. In order to gain complete customer satisfaction, the manufacturer must be careful in selecting and using these component parts to be certain that they can function without excessive maintenance.

We have purchased equipment which temporarily proved satisfactory. After running for a short period, frequent bearing failures were encountered. Experts were called in who found that these bearings were being misused. Thorough investigation proved that the equipment manufacturer was not familiar enough with the operation for which his product was designed.

■ Operating personnel are not infallible either. There was a time in one of our plants when a certain piece of equipment was purchased to do a specific job. It was performing very efficiently in that capacity but was converted by our people to fill an urgent need on a new operation. The equipment subsequently failed due to our misapplication.

The service representative happened to be in the vicinity and we mentioned our plight. He immediately came to the plant and worked on the problem until it was solved. This man did his utmost to be helpful and we have not had a recurrence of trouble. The equipment is still operating because of his excellent attitude regarding service. These representatives can buy a lot of good will. They can also make periodic demonstrations of the latest developments in equipment which might prove adaptable to foundry operations.

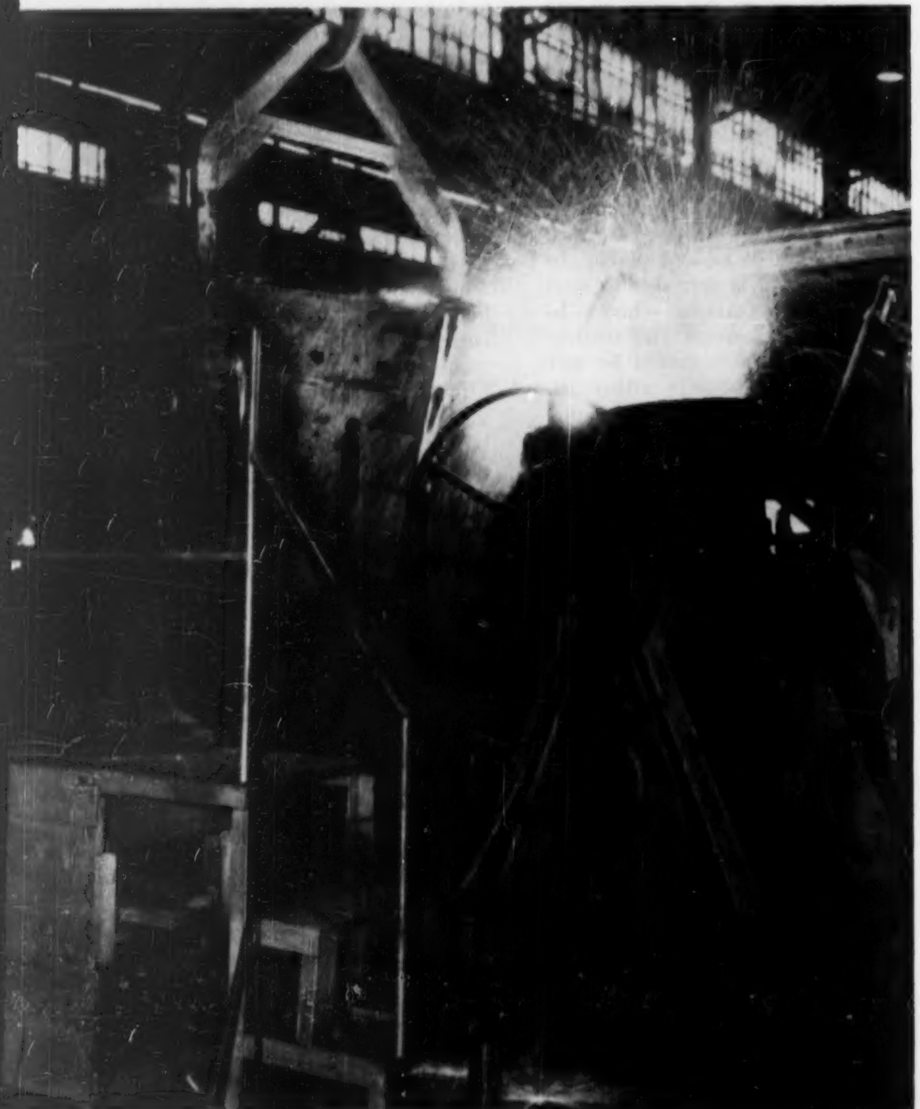
■ The metal castings industry has come a long way, but progress must be accelerated. We find today that some manufacturers hesitate to allocate enough money for research. This makes our growth more difficult, for we cannot possibly engage ourselves in research for your industry. We need your individual support. We want you to build equipment which is flexible so that it can be adapted to these fast changing times, equipment which will insure uninterrupted production, equipment which will keep pace with our goal of improved productivity of quality parts at minimum costs.

STEEL FOUNDRY SAVES 5 MAN-HOURS PER TON

C. B. WILLIAMS/*Works Manager*
Massillon Steel Castings Co.
Massillon, Ohio

Better casting practice reduces cleaning room time, cuts percentage of defectives

Pouring out, then back, mixes metal and cleans slag from teapot spout.



■ We have cut cleaning room labor by approximately five man hours per ton and percentage defective by a little more than 20 per cent by furnishing cleaner steel castings to the cleaning room.

This has been done through concerted effort of all departments of the foundry. To begin with, the heads of all departments meet daily to interpret production and cost factors from the casting blueprint.

Preliminary work by the pattern shop foreman and the foundry technician allow a simple blueprint to be appraised in about 15 minutes. Among topics discussed are the way the pattern should be constructed, heading and gating, cores, type of sand to be used, and cleaning.

Notes kept by the foundry technician are used later by this committee when going over the finish pattern, determining the location and size of head, cracking ribs, gates, etc.

The cost and standards departments take notes that allow them to estimate closely production costs.

Metal factors. One melting department operation that contributes to clean castings is thorough mixing of metal. Our procedure not only insures alloy dispersion, but also cleans slag from the ladle spout that might be picked up during pouring.

Half a 12,000-lb heat is tapped from the arc furnace at 2900-2940 F into the main teapot ladle. Crane scales weigh the first 6000 lb.

We find that metal mixes best when part is poured into a 1500-lb ladle and returned to the teapot ladle. This metal is then poured on the large molding floor.

Adding aluminum while filling the 1500-lb ladle greatly reduces the tendency for it to ball up in the slag, thereby assuring a Type-3 inclusion and good physicals.

Metal left in the furnace is then heated for 12-15 minutes to 3170-3200 F (immersion thermocouple). As alloys are added to the furnace further mixing is unnecessary and the heat is shanked on the small molding floor. Slag is skimmed from the shank ladle before pouring.

Previous practice made it almost impossible to clean slag from the spout sufficiently to keep some of it from being picked up while pouring. Heats were made hotter to compensate for a loss of temperature while the ladleman attempted to clean slag from the spout.

Now we pour molds until slag enters the pouring spout and don't pay much attention to the amount of slag left in the spout at the end of the heat. We used to lose 150 to 200 lb of steel per heat because we stopped pouring before slag entered the spout. Now our loss is between 50 and 75 lb per heat.

Mold Factors. We have little or no washing or scabbing in our work. Almost all is done in green sand, except for a few very heavy section jobs which require skin drying.

Facing and core sand are made of all new, subangular sand from two different sources. Screen analyses of these sands are shown in Table 1; molding mixes are given in Table 2.

Produces Better Finish

We find the blended sand makes hard, dense molds which seem to have better expansion characteristics that result in less scabbing, buckling, and cope pull downs. Also, densely rammed sand provides the casting with a better finish.

Although the sand used for large castings does not have the best flowability due to the amount of bond, it is preferred because it is not too brittle to handle. This sand, rammed to a minimum mold hardness of 85, produces good finish with little washing or scabbing.

Skin dried molds are first washed with two coats of zirconite wash of 65-75 Baume. Cores surrounded by heavy metal sections are also coated with zirconite wash.

Gating and pouring. Very few large-casting defects occur from cope spall or pull down because molds are double poured whenever possible, leaving little time for cope defects to develop. Ceramic tile gating systems are used for all large castings whether single or double poured.

Gating systems are arranged to minimize splashing and mold washing. Molds are sometimes inclined 10 to 15 degrees and metal run uphill. It is very important that once pouring is started, all parts of the mold are progressively and completely filled—allowing no metal to disperse or wash over the mold cav-

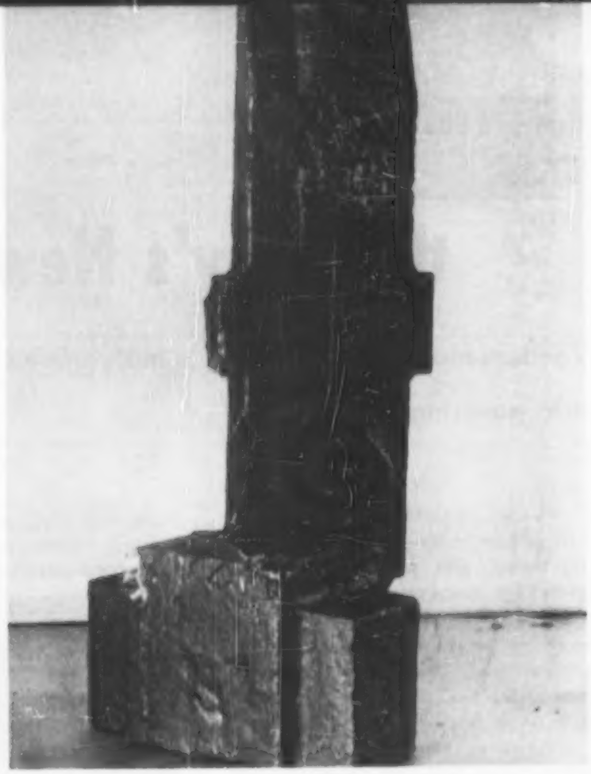
ity surface. We always try to arrange the gating system so that metal is poured on metal.

Parting line gates are used on a large majority of small castings. Tangent gates are used when they help produce clean castings. Very few swirl gates are used, largely due to the very low yield involved.

The gating system is choked 10 per cent from sprue to runner to provide a straining action on the poured metal. Ingate area is enlarged slightly so that metal will enter the cavity quietly.

Dirty cope sides on castings caused by pouring down neckdown heads is avoided, whenever possible, by gating just under the head so that the last metal entering the mold will come up through the neck leaving the hottest metal in the head.

About two years of strict conformity to these procedures has cut cleaning room labor by 5 man hour per ton. About one man hour per ton has been saved in welding alone. Castings defective used to be 4½-5 per cent; now its 3½-4 per cent—an improvement of a little more than 20 per cent.



Drag-side scab on above casting (left) and cope-side defect (right) were caused by metal splashing into the cavity through a gate adjacent to the defect . . .

. . . **Below** . . Defects were eliminated when gating system was redesigned to admit metal to the heavy end and the mold was tilted 10 degrees to fill up hill.

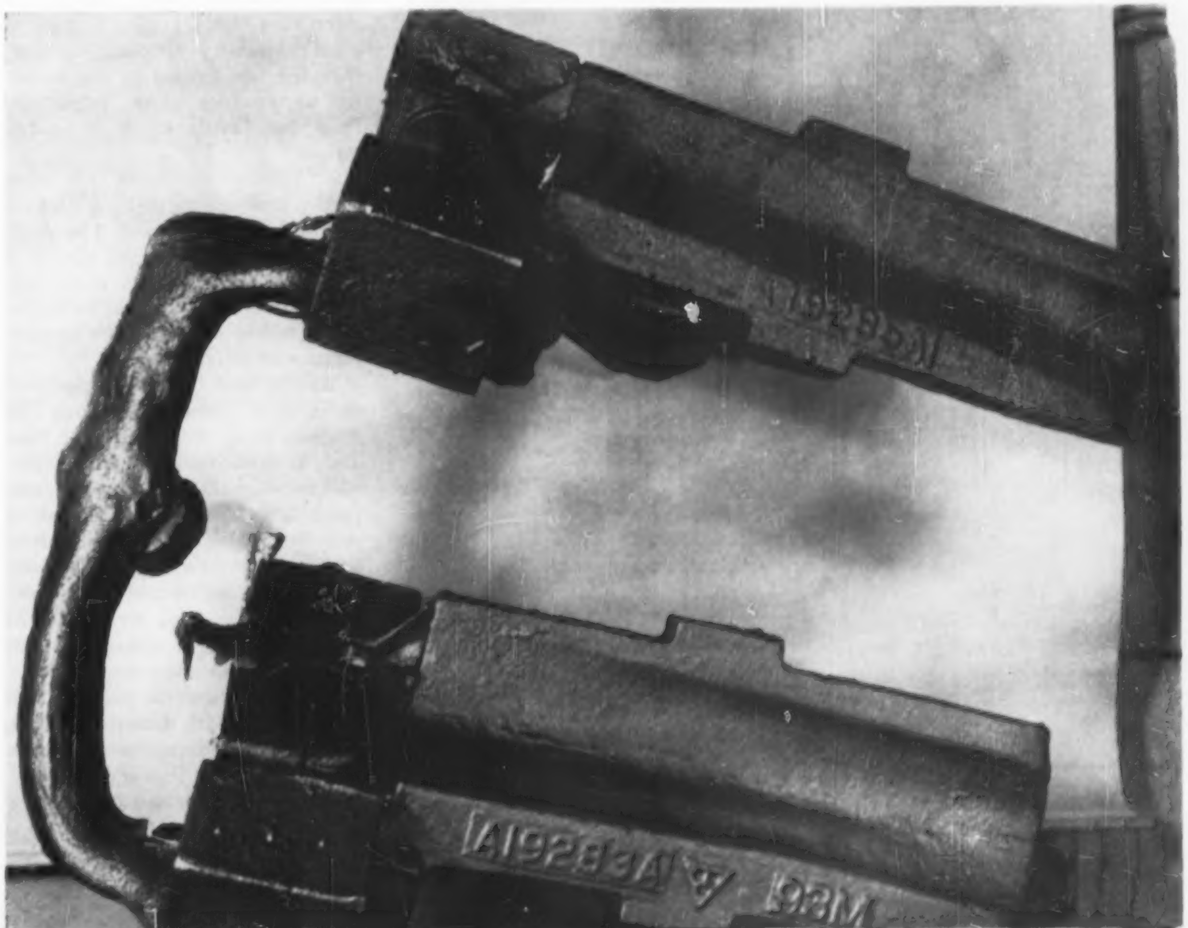


TABLE 1 . . NEW SAND SCREEN ANALYSES

Sand	No. 1	No. 2	50:50
	Per cent retained on Screens		
Screen			(calculated)
20	1.5	—	0.75
30	3.5	0.8	2.15
40	8.0	4.4	6.2
50	22.0	22.4	22.2
70	42.0	29.6	35.8
100	18.0	20.8	19.4
140	3.8	12.0	7.9
200	1.0	6.4	3.7
270	0.1	2.2	1.15
pan	0.1	1.4	0.75
	100.0	100.0	100.10
AFS No.	50.35	69.36	60.33

TABLE 2 . . NEW SAND FACING MIXES

	Small Molds	Large Molds
	per cent	per cent
Sand No. 1	50	50
Sand No. 2	50	50
Bentonite	4.0	4.5
Corn Flour	0.6	0.6
Dextrine	0.4	0.4
Water	3.6-4.0	4.0-4.6

Thermenol —

the Navy's New Alloy

Vacuum-melted iron-aluminum-molybdenum alloy has suprising properties

■ Thanks to the U. S. Ordnance Laboratory at White Oak, Maryland, the foundry industry has a new metal to cast that is light weight, yet has high strength, heat resistance, oxidation resistance, together with excellent magnetic properties and high electrical resistivity.

Known as Thermenol, this high aluminum-steel alloy has already been cast into pipe, heating elements, furnce gratings, chemical containers, and into ingots for rolling.

Thermenol is a ferritic alloy containing no critical elements in short supply; most conventional high temperature alloys contain large percentages of such elements as nickel, chromium, or cobalt. It's an iron-base alloy containing 15-16 per cent aluminum and approximately 3 per cent molybdenum. For casting, some vanadium is added. Stress-to-rupture tests place it in a class equal to, or better than, some types of stainless steel.

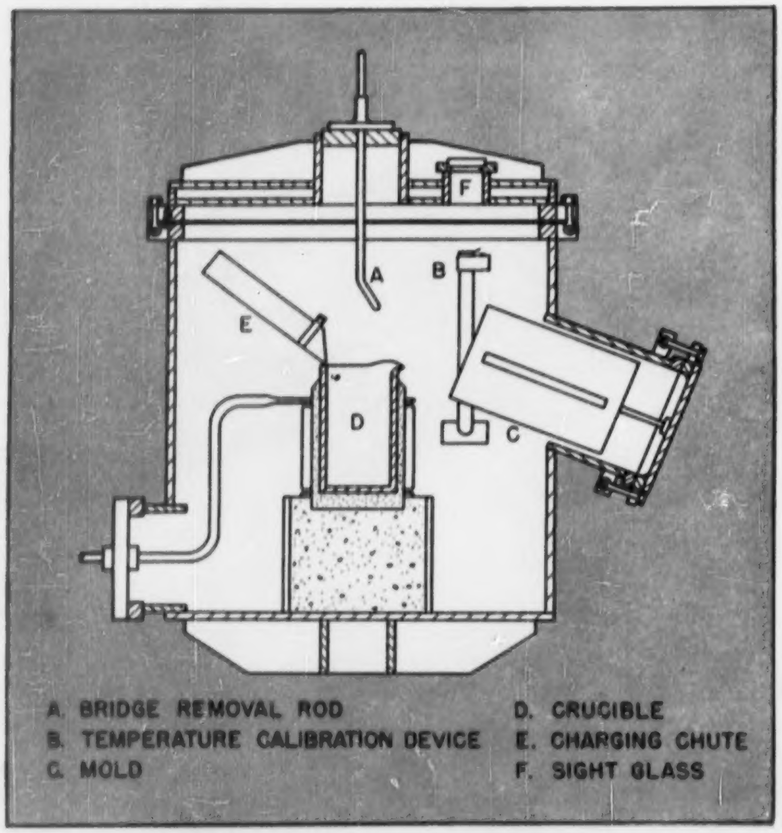
Actually, Thermenol is a modification of 16-Alfenol, the binary alloy of 16 percent aluminum and balance iron developed at the Naval Ordnance Laboratory as a non-critical substitute for high permeability magnetic materials containing large amounts of nickel or cobalt. High aluminum content aluminum-iron alloys have, for some time, been known to possess good magnetic properties, however, their use was limited by the inability to produce these inherently hard and brittle alloys in usable form.

A process involving the controlled atmosphere melting furnace of Fig. 1 was developed. The melting operation is carried out in a high purity magnesium oxide crucible and is accomplished by induction heating in a pressure-vacuum furnace of 30-lb capacity.

The furnace chamber is pumped down to a pressure of about 200 microns prior to melting the iron and molybdenum. This pressure will increase, however, as the components melt, due to the release of dissolved gases. This molten iron and molybdenum solution is given a decarburizing treatment with wet hydrogen, followed by treatment with dry hydrogen (dewpoint −90 F or better) to effect deoxidation.

Then hydrogen is purged from the chamber with pure dry helium, followed by evacuation to remove hydrogen dissolved in the melt during the decarburization and deoxidation treatments. The system is refilled with helium and the aluminum and vanadium, or titanium, whichever the case may be, are added to the melt. Immediately the chamber is pumped down to a pressure of approximately 5 mm, the temperature is adjusted optically, and the melt is poured through a graphite pouring cup (coated with magnesium oxide). A steel slab mold coated with magnesium oxide mold wash is used for ingots.

Immediately after solidification, the ingot is removed from the mold and placed in a furnace at rolling temperature and soaked for two hours prior to rolling. This is done to prevent cracking of the slab due to stresses from rapid chilling.



Thermenol awaited development of a controlled atmosphere furnace.

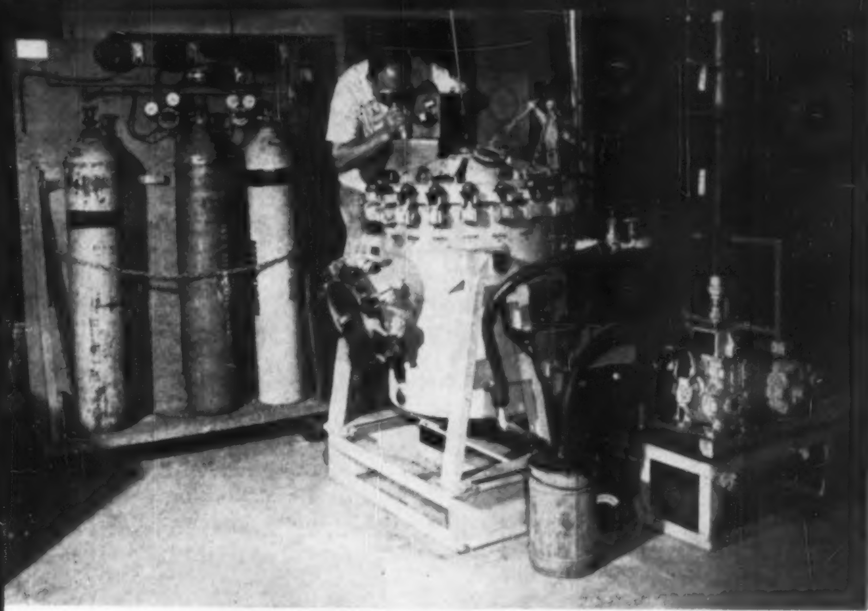
Mechanical Properties

The Alfenol family of alloys derives its resistance to oxidation at elevated temperatures from the formation of a protective surface film of Al_2O_3. Small additions of molybdenum resulted in Thermenol with approximately 100 times the stress-rupture life of the original Alfenol at 1200 F. The low density of Thermenol (about 20 per cent less than stainless steel) makes it a potentially useful substitute or alternate for many aircraft or jet engine applications now using stainless steels of high chromium and nickel compositions.

Tensile tests at room temperature on 0.020-in. cold-rolled sheet Thermenol give values in the vicinity of 82,000 psi. Annealing at 1922 F (1050 C) for two hours to bring out the best stress-rupture strength gives an average value of about 6500 psi ultimate strength. Heating to about 572 F (300 C) seems to increase impact strength considerably.

Is Single Phase Alloy

Maximum high temperature stress-to-rupture life is obtained from Thermenol which has been annealed at 1922 F (1050 C) for two hours and air cooled. The increase in life of five times over a 1472 F (800 C) two hour anneal appears at first glance to be the result of the solution of a second phase, but tests to date show no evidence of a second phase. It is therefore as-



Pressure-vacuum furnace induction melts 30 lb in high-purity MgO crucible.

ROOM TEMPERATURE MECHANICAL AND PHYSICAL PROPERTIES OF THERMENOL

Specimen Form and Condition	Ultimate Tensile psi	Elongation ¾ in. gage length	Hardness[1] dph	Hardness[1] Bhn	Forming Temperature[2] (average)
Cold rolled sheet, 0.020 in. thick	82,000	....	485	452	572 F (300 C)
0.020-in. sheet, annealed at 1922 F 2 hr, air cooled	65,000	3 % avg	343	325	482 F (250 C)

1. Diamond pyramid hardness; Brinell hardness number translated from dph
2. Based upon data obtained from 90° bends.

Physical Properties

Density	=	6.58 gr/cc
Resistivity	=	162 micro-ohm-cm[a]
Recrystalization Temperature	=	1382 F (750 C) for 1 hr[a]
Young's Modulus of Elasticity	=	24×10^{6} [a]
Static Magnetic Properties:		
Maximum Permeability (μ_m)	=	130,000
Initial Permeability (μ_{oo})	=	6500
Coercive Force (H_c)	=	0.017 oersted
Residual Induction (B_r)	=	2950 gauss
Maximum Flux Density	=	5750 (B_m at H = 30 oersteds)

a. Cold worked 0.020 in. thick sheet

sumed to be a single-phase alloy.

While only those alloy compositions which lend themselves to cold rolling have been evaluated at the Naval Ordnance Laboratory, other alloys show promise for use in cast form. Slight additions of vanadium along with molybdenum produce a hard casting, which—though difficult to cold work and machine—appears to retain the desirable oxidation resistance of the ternary-type alloy. Past experience shows that in alloys of this type a considerable increase in high temperature strength can be expected from additions that allow precipitation hardening to take place. This phase of Thermenol development is currently under consideration.

Miscellaneous Properties

Oxidation resistance of Thermenol to temperatures as high as 2300 F (1260 C) is excellent; at least as good as the 16 per cent Al-Fe alloy.

Like 16-Alfenol, Thermenol has extremely good corrosion resistance to oxidizing solutions, such as concentrated nitric acid at room temperature. The standard 20 per cent salt spray test produced some pitting-type corrosion; however Thermenol appears to have better resistance to salt spray than 16-Alfenol, probably due to molybdenum content.

Under normal atmospheric conditions Thermenol shows no evidence of corrosion. Polished samples exposed to the atmosphere and handled daily for about a year still retain the original polished appearance.

Heating elements of thermenol combining excellent oxidation resistance and a high electrical resistivity of 160 micro-ohm-cm have a comparatively long life for elements of this type.

Thermenol can be machined satisfactorily at room temperature using a slow tool speed and sufficient coolant. It can be arc or resistance welded without difficulty.

Being about 20 per cent lighter than stainless steel, and having a high strength/weight ratio, Thermenol offers obvious advantages, especially in the aircraft industry.

Preliminary tests show Thermenol to have excellent magnetic properties. A maximum permeability as high as 130,000, an initial permeability (μ_{oo}) of 6500, and a coercive force of 0.017 oersted have been obtained on 0.014 in. thick laminations.

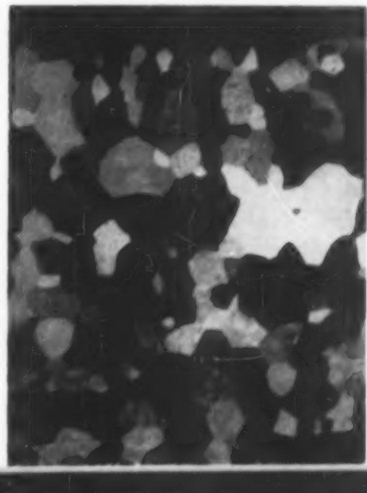
A summation of some of the room temperature properties of Thermenol is given in the table.

Condensed from NAVORD REPORT 3700, "Thermenol, a Non-Strategic Aluminum-Iron Base Alloy for High Temperature Service," U. S. Naval Ordnance Laboratory, White Oak, Md.

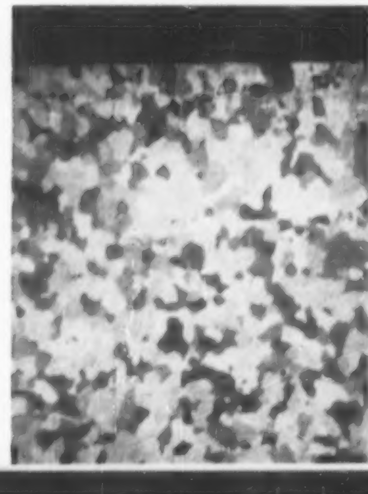
Cast in steel mold, 1 atm He; $FeCl_3$, HNO_3, HCl etch; X6.

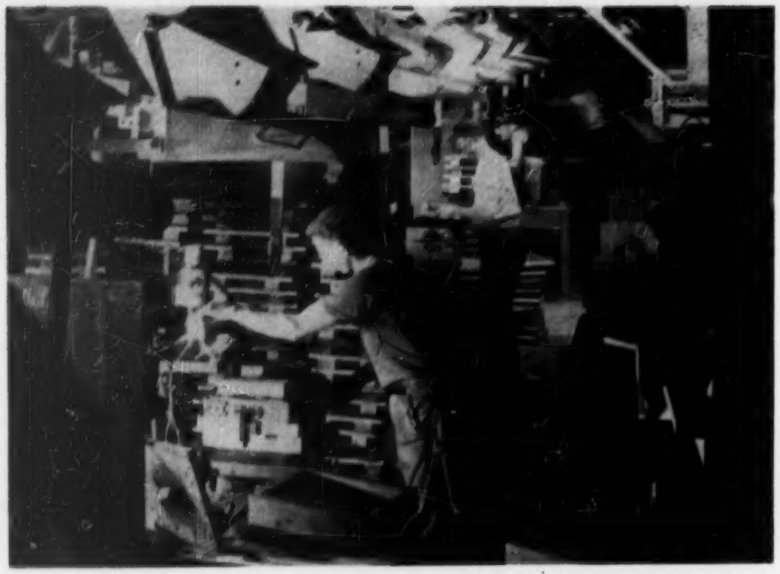
Thermenol cast in a ceramic mold, same conditions as left.

In steel, 5 mm He, X6, etched.



Same as left with grain refined.





Every-day foundry practice, as well as technological research and development in the foundry field, is covered in 1955 AFS TRANSACTIONS.

Key to Better Foundry Practice

■ Wealth of up-to-date information on foundry practice is to be found in the 1955 TRANSACTIONS of the American Foundrymen's Society. Besides containing the official proceedings of the 59th Annual Meeting at Houston, Texas, and reports of officers and committees, this 8½ by 11½-in. case bound volume of over 800 pages has the 110 papers of 167 authors (together with discussion) that were presented at Houston.

Articles of universal appeal include: *"Probable Developments of Air Pollution Problems and Their Effects on the Foundry Industry," "Production Standards and Their Place in the Foundry," "Improved Foundry Paperwork,"* and *"What are Your Raw Material Costs?"*

Quality control, in the form of seven articles of a symposium on non-destructive testing, covers magnetic partical inspection, stress analysis, and radiography with x-ray and cobalt 60.

"Application of Heat Transfer Principles to Foundry Practice" (Dr. H. A. Schwartz Memorial Forum) includes eight articles on range of effectiveness of chills, use of insufficient chills and of indirect chills, also feeding range in shell molds, and risering of nodular iron and of steel.

Just about every phase of AFS technical activity is represented in articles on industrial engineering, steel, sand, gray iron, patternmaking, education, refractories, plaster mold casting, plant and plant equipment, safety, hygiene, and air pollution control, malleable, light metals, and brass and bronze.

Vacuum melting, vacuum degassing, and vacuum pouring are brought out in different articles. Several aspects of ladle injection and of ductile iron are also included. There is a summary of test patterns for evaluating sand mixtures and a critical analysis of the cylindrical standard test specimen. Design of steel castings is covered, especially in weldments.

This unique publication containing valuable information for everyone connected with the foundry field, will be available before the end of the year. 1955 TRANSACTIONS, Vol. 63, is $8.00 to AFS members, and $15.00 to non-members. Write to Book Department, American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill. AFS pays postage when remittance accompanies orders (USA only).

27th Meeting

GIFS Investigates Market and Costs

■ Markets, costs, labor relations and safety were the highlighted subjects at the 27th annual meeting of the Gray Iron Founders' Society October 19 to 21 at the Schroeder Hotel, Milwaukee. C. H. Ker, Dalton Foundries Inc., Warsaw, Ind., GIFS president, presided at all sessions.

Ker was later reelected president of the society for the coming year. Other officers reelected at the meeting were: C. H. Meminger, Posey Iron Works, Inc., Lancaster, Pa., secretary, and W. O. Larson, W. O. Larson Foundry Co., Grafton, Ohio, treasurer, J. Scott Parrish, Jr., Richmond Foundry and Mfg. Co., Inc., Richmond, Va.., was elected the new vice-president.

New directors named for three year terms were William Z. Taylor, Taylor & Co., Inc., Brooklyn, N.Y.; J. Scott Parrish, Jr.; C. S. Wieland, Mid-City Foundry Co., Milwaukee; and A. H. Renfrow, Renfrow Foundry, Los Angeles.

Reappointed executive vice-president was Donald H. Workman.

New officers and director were announced at the luncheon closing the meeting. Other features of the luncheon included presentation of citations and awards for industry and society service, and prizes for winners in the 1955 Redesign Contest. John M. Price, Ferro Machine & Foundry, Inc., Cleveland, was honored with the G.I.F.S. Gold Medal for his leadership in organizing and financing the Foundry Educational Foundation and for his service as Chief of the Metals Section of the Office of Price Administration during the Korean emergency period.

Citations for unusual service to GIFS and to the industry were presented to Earl Paltenghi, H. C. Macaulay Foundry Co., Berkeley, Cal.; Earl H. Thompson, H. P. Deuscher Co., Hamilton, Ohio, and Charles H. Ker, Dalton Foundries, Inc., Warsaw, Ind.

B. W. Johnson and C. E. Day, Aquamatic, Inc., Rockford, Ill., took the $500 first prize in the Re-

C. H. Ker

design Contest. This annual event is conducted to give recognition to engineers and designers who have redesigned products of competitive materials for production in gray iron. A $250 second prize went to Frank K. Clifford, Olney Foundry, Link-Belt Co., Philadelphia and William S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa., took the $100 third prize. Honorable mentions were: G. K. Stauffer, Reading Gray Iron Castings Co., Reading, Pa., W. A. Morley, Link-Belt Co., Philadelphia, and Norman J. Petitte, Superior Foundry, Inc., Cleveland. The Redesign Committee reported that they had received the largest number of entries in the six year history of the program.

The first speaker at the meeting presented was Carl Oechsle, Deputy Assistant Secretary of Commerce for Domestic Affairs, U. S. Department of Commerce. Oechsle spoke at the Industry Luncheon. During the business session that followed Oechsle's talk, G.I.F.S. members heard a panel discuss *"How We Can Expand Our Markets."* Panel

moderator was Dr. Ira D. Anderson, president, American Marketing Association and associate dean, School of Commerce, Northwestern University. Panel speakers were Robert J. Eggert, Ford Motor Company and Bay E. Estes, U. S. Steel Corp.

Three speakers were presented on Friday morning. They were: Clifford L. Chatterton, Liberty Mutual Insurance Co., Pittsburgh, whose topic was *"The Top Executive Looks at Safety;"* Robert B. Hill, Canada Iron Foundries, Ltd., Montreal, Quebec, who discussed *"Cost Control—The Key to Increased Foundry Profits;"* and Lee C. Shaw, Seyfarth, Shaw & Fairweather, Chicago, who presented *"1955—A Most Historical Year in Labor Relations."*

Final speaker of the annual meeting was Major Norman Imrie, Smith Agricultural Chemical Co., Columbus, Ohio, who spoke at the luncheon that closed the two day program.

■ This is the obituary of a man who knew better. He was a supervisor, a foreman, and he was in a hurry. He died in a hurry.

This is an old story although the accident just occurred. It is told here to prevent a similar incident in your plant.

This foreman was mixing a silicone with a flammable dispersing solvent for use in a shell molding machine. He had been instructed to mix the silicone in a closed drum by rolling the drum until the ingredients were well mixed. A day's supply of the mix could then be taken from the drum.

On this day, he decided to save time by carrying the drum to the shell molding area at a point near the gas burner used to fire the oven. He then decided to mix the silicone and the solvent in an open drum by bubbling compressed air into the liquid.

The flammable solvent splashed on him, vaporized, and saturated his clothing. The vapor ignited in an open flame of the gas burner.

The foreman had burned to death before a rescue could be attempted.

New Englanders Face Problems of Small Shop

PAUL R. FOGHT/*Assistant Editor*

David Golling, chairman of MIT student chapter, AFS, assisted in reporting this meeting. He attends MIT on a scholarship from Symington-Gould Corp., Depew, N. Y.

■ Operations in small foundries with six to 16 molders was the theme of the 15th New England Regional Foundry Conference held at Massachusetts Institute of Technology, October 14 and 15, under the sponsorship of the New England Foundrymen's Association, MIT, the MIT Student Chapter of AFS, and seven other groups repre-

Committeemen Prindle and Klein get money on the line from "Chris" Christenson.

senting the castings industry in New England.

Nine sessions, including simultaneous sessions for ferrous and non-ferrous foundrymen, were held under the general chairmanship of Henry G. Stenberg, Draper Corp., Hopedale, Mass. Howard B. Nye, Crompton & Knowles Loom Works, Worcester, Mass., was vice-chairman. Ferrous program was under the direction of Clyde Armstrong, Warren Foundry & Pipe Corp., Everett, Mass.; handling non-ferrous were Frank Volpe, Somerville Machine & Foundry Co., Somerville, Mass., and Julius Ferrari, Gorham Mfg. Co., Providence, R. I.

Henry Stenberg officially opened the conference and introduced C. Richard Soderberg, dean of engineering, who welcomed the conference to MIT.

Speaker at the first session, a combined session for both ferrous and non-ferrous, was Raymon F. Meader, Whitin Machine Works, Whitinsville, Mass. His topic was *"Green Sand Casting Finish."*

New England foundries have been more conscious of the importance of good finish than foundries in other areas, he said in pointing to the importance of producing a good appearing product if the foundry is not to lose business to competing foundries or other metal working industries. Mr. Meader stressed the importance in every foundry of the use of the screen analysis of the sand, frequent checks of mold hardness, proper maintenance of patterns, and use of a sand testing program as means of obtaining and maintaining good casting finish.

Foundries with sand testing labs should make full use of the information made available by the tests, he stated. The information should be developed so that it can take the form of a brief report useful to the foremen. In summary, he stated that all handling of the sand should be based on analysis, rather than on guesses.

William J. Francis, Jr., Draper Corp., Hopedale, Mass., was chairman of the first session.

First day's ferrous session featured Fred C. Barbour, Pig Iron Div., Republic Steel Corp., speaking on *"The Effect of Gases and Trace Elements on Cast Iron,"* and Chester Thomas, National Engineering Co., Chicago, speaking of the *"Economical Mechanization of Small Foundries."*

Mr. Barbour's paper discussed ". . . well known, but often overlooked, metallurgical aspects of pig irons." He stated that enough metallurgical facts are known about pig irons to explain their behavior under any circumstances. Barbour discussed the development of chemical control in the manufacture of castings and its importance in isolating the actual causes of casting defects once blamed on the pig iron.

The paper detailed the importance of the carbon in the pig iron and noted that it is the one element not stipulated in standard pig iron specifications. Barbour discussed control of carbon content through standardization of operating conditions. He then detailed the effects on castings of tramp elements and of gases.

Mechanize to Live

Chester Thomas told the ferrous audience that the decreasing supply of skilled labor will force small foundries to mechanize to stay in business. Thomas explained the Machinery & Allied Products Institute formula which may be used by a small foundry in developing a long range, 10 to 20 year plan of mechanization. The more human elements that can be removed from production, the easier it becomes to obtain quality in castings, he

Chairman Stenberg proves point at joint technical sesson.

said. To exemplify the introduction of mechanization to increase production, Mr. Thomas showed how the elimination of peening and carry-out can increase a molder's production by five molds a day.

Frank A. Soukup, Bullard Co. Bridgeport, Conn., and Warren Murdock, Acme Foundry Co., Inc., Chelsea, Mass., acted as chairman for the afternoon session.

In their first day's sessions, non-ferrous foundrymen heard papers by Charles V. Knobeloch, R. Lavin & Son, Inc., Chicago, *Manganese & Aluminum Bronze Foundry Practice,"* and George T. Hubbell, American Refractories & Crucible Corp., North Haven, Conn., *"Crucibles and Refractories—Their Care and Maintenance."*

MYSTIC IRON WORKS PHOTOS BY R. V. MARTIKKE

Non-ferrous group fills MIT lecture hall for first day's sessions.

Hubbell pointed to the wide variation from foundry to foundry in annual expenditures for refractories and crucibles as showing the need for more knowledge in the handling and use of these items. He stated nine steps to follow to lower crucible and refractory cost. These included unpacking refractories when they arrive from the factory to check breakage, rapid pour off, melting of short heats in small crucibles, and keeping the crucible clean.

Drossing characteristics of manganese and aluminum bronze create major problems that can be eliminated by using the proper procedure to fill the mold cavity, according to Charles Knobeloch. He advised filling the cavity from the bottom with a horn type gate and pouring in a very short time. Knobeloch also remarked that stress corrosion cracks at high tensile strengths may result from poor foundry practice.

Chairmen for the non-ferrous sessions on the first day were F. D. Volpe, Jr., Somerville Machine & Foundry Co., Somerville, Mass., and Patrick Malloy, Scovill Mfg. Co., Waterbury, Conn.

Henry Stenberg presided at the conference banquet. Toastmaster was Professor Howard F. Taylor, MIT; principal speaker was "Gad-dabout" Gaddis, "the fisherman's fisherman," who appeared through courtesy of Mystic Iron Works and New England Coke Co.

The second day of the meeting opened with a joint ferrous and non-ferrous group listening to a paper on *"Casting Defects"* presented by W. A. Hambley, Charles A. Krause Milling Co., Milwaukee.

$1050/day Loss

Scrap castings are a direct loss to the business, Hambley stated, and a 10 ton gray iron foundry making 5 percent scrap and having 2 percent returns from customers is losing $1050 every week. A 1000 pound brass foundry with the same percentages of defective castings is losing $37.50. Hambley said that these losses are actually lower than average. Main responsibility for scrap is in top management, according to Hambley. Casting defects may result from management lacking proper information, failure to evaluate the ability of equipment for a job, and failure to interest the employees in doing a good job.

Lewis Greenslade, Brown & Sharpe Mfg. Co., Providence, R.I., was chairman of the joint session.

The ferrous session for the second day of the meeting heard William G. Parker, General Electric Co., Schenectady, N. Y., discuss *"Some Aspects of Sand Practices for the Small Foundry."*

Mr. Parker reviewed sand practices in the small foundries of yesterday and today. In discussing today's practices, he detailed the high temperature effects of additives and sand blending. He recommended that small foundries study available data on high temperature effects as a substitute for actual sand testing at higher than room temperatures. After reviewing current practices, Parker took a brief look into the future and speculated that mechanization of big production foundries will not elimiante alert, small foundries producing quality castings.

Robert C. Walker, Whitin Machine Works, Whitinsville, Mass., acted as chairman for the session.

The non-ferrous session featured a talk on *"Plaster Molding"* by Julius Ferrari, Gorham Mfg. Co., Providence, R.I.

Ferrari discussed his experiences in producing radar wave guides with plaster molds. The development of plaster molding techniques can be accomplished only by trial and error in each individual shop, he said, but it should not take too long for any foundry to find its answer. Ferrari discouraged attempts to control dimensions to tolerances of 0.001 to 0.002 in. He stated that such control is not possible with plaster molding.

Chairman of this non-ferrous session was Walter Carlson, Carlson Pattern Works, Springfield, Mass.

A joint session concluded the technical program for meeting. At this session Michael Bock II, Exomet Corp., Conneaut, Ohio, spoke on *"Gating and Feeding."*

Bock discussed insulated and exothermic risers, using slides to compare casting soundness, yield, and

continued on page 83

NFA Discusses . .

Hiring Foremen and Paying for SUB

■ Largest attendence in many years was reported at the 57th annual meeting of the National Foundry Association held at the Edgewater Beach Hotel in Chicago October 6 and 7 under the chairmanship of W. W. C. Ball, Taylor and Fenn Co., Windsor, Conn., NFA president.

Members attending the two-day session considered management problems in arbitration, bargaining, securing supervisory personnel, and problems resulting from supplementary unemployment benefit agreements in other industries. Administrative and committee meetings were held on October 5 and and officers for 1955-56 were elected the first day's general sessions. New officers are: president, Paul L. Arnold, U. S. Pipe & Foundry Co., Chattanooga, Tenn.; vice-president, Arthur G. Hall, Nordberg Mfg. Co., Milwaukee; treasurer, Frank J. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill. Charles T. Sheehaan was reapointed executive secretary.

Mr. Ball opened the October 6 meeting with the president's report. He then introduced the first speaker, Dr. Clarence M. Updegrall, labor arbitrator and professor of law at the University of Iowa. Dr. Updegraff discussed the essential steps to be taken in preparing a case for arbitration in his talk, *"Preparation for Arbitration."*

Second feature of the day was *"You Are There at the Bargaining Table,"* a motion picture of an actual bargaining session between Rogers Corp. and AFL representatives. The unrehearsed film taken by the AMA showed the progress of the negotiation.

Luncheon seaker was Alice Widener, publisher and editor of *U.S.A.* Miss Widener's talk, *"Behind the U.N. Front,"* presented her observations of the manner in which activities of the U.N. affect industrialists.

A panel discussion *"Group vs. Individual Company Bargaining"* was presented for the afternoon ses-

NFA Administrative Council. Seated, left to right: Lewis N. Essex, Herman Menck, Vice-President Arthur G. Hall, President Paul L. Arnold, Past President William W. C. Ball, Summerfield Brunk, R. F. Heiden. Standing, left to right: George A. Euskirchen, Curtis B. Hasty, Jr., A. Lysle Dyer, R. R. Washburn, Executive Secretary C. T. Sheenhan, Robert M. Walton, R. C. S. Potter, W. G. Greenlee, S. J. Moran.

sion. The relative merits of these concepts of collective bargaining were presented by teams representing foundries on both sides of the question. Those favoring group bargaining were R. J. Redmond, Buckeye Foundry Co., Cincinnati, and George Grosser, Manufacturers Industrial Relations Association, Kalamazoo, Mich. The case for individual company agreements was presented by A. V. Martens, Pekin Foundry & Manufacturing Co., Pekin, Ill.; R. R. Washburn, Plainville Casting Co., Plainville, Conn.; and William G. Raven, Continental Motors Corp., Detroit.

Foreman as Management

Foremen are the first line of management and the policies for hiring, promoting and training them are of tremendous importance in foundry operations. That's what NFA members were told by a panel the second day on *"The Role of the Foreman in the Foundry."* Panelists were C. A. Carolin, R. B. Carolin Foundry & Machine Co.; A. G. Hall, Nordberg Mfg. Co.; W. E. Jones, Josam Products Co.; and J. D. McGill, United States Pipe & Foundry Co., Birmingham.

But where are foundries going to find foremen? There was sharp disagreement among panel members as to whether to promote the foremen from within the organization (it may spoil a good mechanic and it promotes inbreeding of the organization) or whether to seek foremen outside the organization (you can look for more precise qualifications and do more careful screening). The outside man has to be taught more about the individual foundry's operations and plant techniques while the man from inside has to be taught more about human relations.

There was solid agreement among the panelists that as the first line of management the foreman should be paid well enough so that he doesn't have to worry about his pay and so that, considering the overtime of the men under him, they don't end up making more money than he does. "If you're going to make him a boss, make him a real boss," declared A. G. Hall.

McGill emphasized that to his men the foreman is management and is the company. "The average foundry worker is woefully ignorant of company philosophies and policies," he said. "The man who can give the clearest picture to the shop employee is the foreman. If the foreman is obviously trying to do what is right, then the worker's attitude is that the company is trying to do right."

To achieve this, foreman must be trained to the company's philosophies and policies. And foundries themselves must recognize that foremen are management and not errand boys. The foremen must be made responsible for their jobs and they must be given authority to do them. They must be selected, trained and treated so that every-

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NFA 50 YEAR MEMBERS

Twenty-four organizations were honored at the annual meeting of the National Foundry Association as they celebrated their 50 years of membership in that group. Plaques were presented to these firms:

Acme Foundry Corp.
Aermoto Co.
American Seating Co.
Barnett Foundry & Machine Corp.
Buflovak Equipment Div. Blaw-Knox Co.
Lewis Machinery Div. Blaw-Knox Co.
Rolls Div. Blaw-Knox Co.
Union Steel Castings Div. Blaw-Knox Co.
Buckeye Foundry Co.
Dean Brothers Pumps Inc.
Benjamin Eastwood Co.
Eddy Valve Co.
Florence Pipe Foundry & Machine Co.
Harnischfeger Corp.
Mackintosh-Hemphill Co.
Meeker Foundry Co.
Mesta Machine Works
Morris Machine Works
Nordberg Mfg. Co.
Pusey and Jones Co.
Sargent and Co.
Standard Buffalo Foundry, Inc.
Straight Line Foundry & Machine Corp.
Swayne, Robinson & Co.

foundry facts

Tentative Shell Tensile Test

• A highly reproducible test is needed for control of production shell mold sand mixtures on a day to day, hour to hour basis. Since reproducibility of results is more important than duplication of procedure, deviations that allow maximum success with individual laboratory equipment are encouraged.

The Shell Molding Materials Testing Committee (8-N) of the Sand Division of the American Foundrymen's Society approved the following tentative standard tensile test for the control of shell molding sand mixtures.

Specimen

Test specimens shall be of the standard AFS tensile briquet (dog-bone) shape having 0.250 ± 0.010 in. thickness. They should be made from samples of the production shell molding sand mixture to be evaluated.

Equipment

Briquet specimens shall be made in a three-part metal core box. Specimen dimensions are detailed on page 141 of the AFS Foundry Sand Handbook, sixth edition. A three-cavity core box for 0.250-in. thick specimens is commercially available.

A 6-in. length of 2-in. ID pipe or tube and a sheet metal bottom plate are used to invest a 3-gang core box with sand mix. As illustrated in Fig. 1, 1/16-in of metal is machined from one half of one end of the tube.

For striking off excess sand a strip of 0.020-in. spring steel, 11 in. long and 1¼ in. wide is quite satisfactory.

The curing oven must have a temperature range of at least 475 F. Since the curing cycle for a shell mold is comparatively short, the test oven must also have rapid heat recovery to insure curing at the proper temperature.

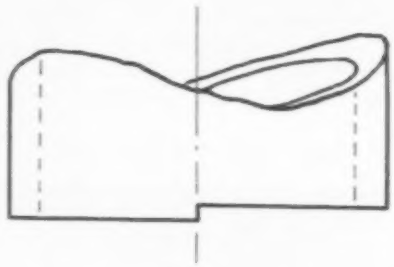


Fig. 1 . . One-half of one end of the sand investing tube is relieved 1/16 in.

Specimens may be broken on any suitable tensile testing machine with jaws designed to eliminate a notch effect.

Preparing the Specimen

1. Invest the core box only when it is at a temperature of 400 ± 10 F (measured on the bottom plate). This is most easily accomplished by overheating the box about 25 degrees and letting it cool to temperature.

Place the core box assembly on insulating material to prevent excessive heat loss during investment.

2. Treat core box surfaces with the same release agent used in production.

3. Place the sand investing tube on its bottom plate and fill it with the sand mixture. Set them directly over the outer edge of the first cavity (of a multiple cavity box) and withdraw the bottom plate.

With the tube in a position such that the relieved portion of tube end trails, move it over the entire length of the core box, filling each cavity (Fig. 2 and 3). The tube-end gap leaves excess sand on the box.

4. Place the strike off knife along the longitudinal center line and, holding it perpendicular to the box, strike off excess sand from one side, then the other. Figure 4 shows the completion of one-half the strike-off operation and Fig. 5 shows the knife in position to strike off the second half.

5. Place the filled core box in the oven at a predetermined temperature for a given length of time. For example: 475 ± 10 F for four minutes. Proper curing is achieved when the color of top and bottom surfaces are uniform.

Specified time and temperature may not be the same for all types of equipment. Plot a curve of curing time vs tensile strength at optimum oven temperature and then use a curing time along the least slope por-

Fig. 2 . . With gap trailing, position sand tube, and remove bottom plate.

foundry facts

Tentative Shell Tensile Test

Fig. 3 . . Move the tube along the core box and onto bottom plate again.

tion for future testing.

Investment, strike-off, and cure cycle should be accomplished in as short an interval as possible to prevent excessive temperature drop in the core box.

6. Cool specimens to room temperature before testing.

Testing Specimens

1. Average the tensile strengths of six specimens to arrive at the tensile of the sample.

2. Exclude specimens with deep scratches or ridges.

3. Fit specimens into the jaws of the tensile testing machine in a manner such that they are gripped uniformly along the lateral surfaces and so that the load is applied along a line through their axes.

4. Record the breaking load in pounds and multiply by four to get the tensile strength in pounds per square inch for each specimen.

Shell Material Testing Committee

Members of Committee 8-N are: Nicholas Sheptak, Metallurgical Laboratories, Dow Chemical Co., *chairman;* Louis J. Pedicini, Process Development Section, General Motors Corp., *vice-chairman;* and John Wanamaker, Pennsylvania Glass Sand Corp., *secretary.*

Jack E. Bolt, Chemical Materials Dept., General Electric Co.; Daniel R. Chester, Foundry Products Div., Archer-Daniels-Midland Co.; Walter H. Dunn, Pacific Alloy Engineering Corp.; Galpin M. Etherington, Metallurgical Dept., American Brake Shoe Co.

William A. Geisler, Hillsdale Foundry Co., Inc.; Alex L. Graham, Harry W. Dietert Co.; William Ochenski, City Pattern Foundry & Machine Co.; John G. Smillie, John Deere & Co.

John L. Stark, Barrett Div., Allied Chemical & Dye Corp.; Emery I. Valvi, A.R.D. Corp.; and Burgess P. Wallace, Whitehead Brothers Co.

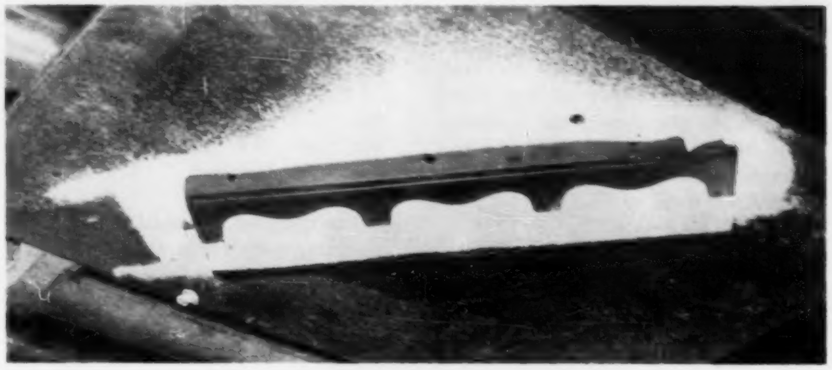
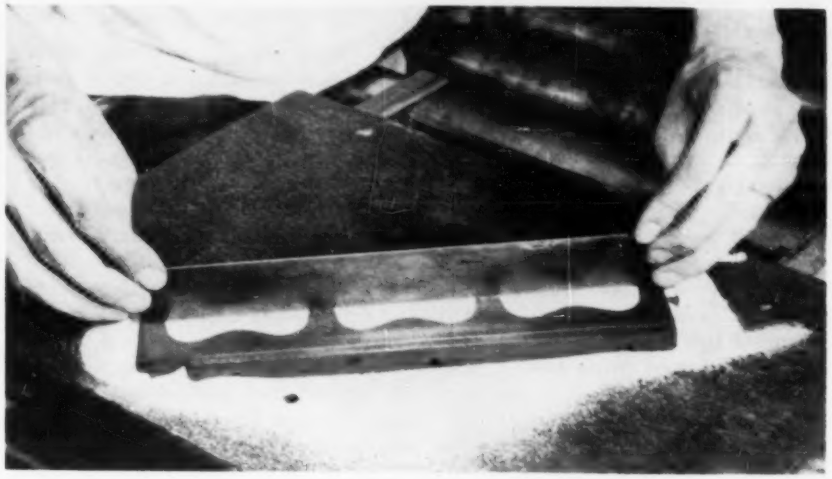


Fig. 4 . . Strike off excess investment from one half of the box at a time.

Fig. 5 . . Hold the strike-off knife perpendicular to the core box surface.



NFA Meeting

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one knows they are important management.

Top management-foremen relations is a two-way street, however. The foreman must be loyal to the company, he must keep management informed of all problems and potential problems he must be absolutely honest in reporting to management.

"Man in Action—Man in Contemplation" was the subject of Dr. Houston Cole, speaker at Friday's luncheon. Dr. Cole, president of Alabama State Teachers College, Jacksonville, Ala., commented on the gap between management's plans and management's action in human relations.

Supplementary unemployment benefit plans, so-called guaranteed annual wage programs, are a problem that calls for action by the castings industry, NFA meeting attendants heard. What plans mean to the industry, and what should be done about them, was the subject of a panel discussion that closed the meeting on Friday.

Members of the panel were: Karlton W. Pierce, Ford Motor Co., Dearborn, Mich.; Floyd Lawrence, *Steel*, Detroit; Robert L. Schutt, City National Bank and Trust Co. of Chicago; Joseph Daoust, M.C.A., Morss, Seal and Daoust, Detroit, Mich.; and James L. Poole, Fairchild, Foley and Sammond, Milwaukee.

Ford Motor Co.'s new labor contract which includes supplementary unemployment benefits, will have no effect on company decisions to buy or make a particular item. Pierce stated that there are several factors which would keep Ford from making components temporarily to prevent a lay off. These factors include the high cost of maintaining standby equipment and expense of training the work force for fill-in production.

Foundries have more to fear from their failure to keep up with technological progress than from new unemployment benefit plans, according to Floyd Lawrence. He maintained that any effort of the auto companies to stabilize production will benefit suppliers of castings by permitting stabilization in their plants also.

Economic analyst Schutt countered the remarks of the Detroit representatives with his opinion that any continuing, wide spread unemployment in the automotive industry might make production of parts now purchased an economic necessity.

Joseph Daoust, actuary and pension consultant, warned suppliers not to accept labor costs that would make their production more expensive than production in the auto plants. Adoption of supplementary unemployment plans may prove less expensive than straight cash increases he said in analysing the plans now in effect.

A new plan that would make it easier for smaller firms to offer the fringe benefits was presented by attorney Poole. He recommended establishing a fund in the name of the individual employee which could be used by the employee when he needs economic assistance. Contributions to the fund would come from company profits.

AFS Directors Hear Fall Reports

Unprecedented early demand for exhibit space at the 1956 AFS Castings Congress highlighted reports to the board of directors of the American Foundrymen's Society at their meeting in Chicago November 10 and 11. Clockwise starting in left foreground are: C. E. Nelson, General Manager Wm. W. Maloney, E. C. Hoenicke, C. C. Drake, R. W. Trimble, H. C. Erskine, Frank C. Cech, C. W. Gilchrist, O. J. Myers, B. G. Emmet, C. V. Nass, Assistant Secretary A. B. Sinnett, Vice-President F. W. Shipley, President Bruce L. Simpson, R. A. Oster, M. J. Lefler, W. A. Morley, W. R. Pindell, W. M. Hamilton, L. H. Durdin, H L Ullrich, Thomas Kaveyn, Jr, G. Ewing Tait, Past President Frank J. Dost, and C. E. Brust.

Steel Executives Review Progress

Speakers' table. Top photo, left to right: R. M. Schumo, Pennsylvania Electric Steel Casting Co.; Mrs. R. M. Schumo; W. D. Bailey Jr., Westlectric Castings Inc.; Mrs. W. D. Bailey; G. W. Myers, Crucible Steel Casting Co.; Mrs. G. W. Myers; T. F. Dorsey, Pittsburgh Steel Foundry Corp.; Mrs. T. F. Dorsey; A. T. McKee, Strong Steel Foundry Co.; Mrs. A. T. McKee; Clarence Tolan Jr., honorary member; Mrs. Tolan; A. J. McDonald, Amerian Steel Foundries and president, S. F. S. A. Lower photo: Mrs. A. J. McDonald; A. S. Trowbridge, Dibert, Bancroft & Ross Co.; Mrs. J. L. Bonney; J. L. V. Bonney Jr., Bonney-Floyd Co.; Mrs. H. F. Park; H. F. Park Jr., General Steel Castings Corp.; Mrs. T. V. Taylor; Tullie V. Taylor, honorary member; Mrs. F. K. Donaldson; F. Kermit Donaldson, executv evice presdent, S. F. S. A.

■ Executives of America's steel foundries met for their 53rd Fall Meeting of the Steel Founders' Society of Amerca at The Greenbrier, White Sulphur Springs, West Virginia, on October 24 and 25.

SFSA President A. J. McDonald, American Steel Foundries, set meeting theme in his opening remarks entitled *"A Healthy Steel Foundry Future.* President McDonald reviewed some of the activities of the past 6 months in the Society, among which were the continued development of a single source of steel casting specifications for the industry, the conclusion of chapters by the technical staff and industry personnel for the forthcoming A.S.M. educational program on steel castings, and the key part which the Society's staff and industry engineers were taking in developing magnetic particle inspection standards for pressure castings.

F. Kermit Donaldson, SFSA executive vice president spoke on *"Executive Responsibility"* as it applied to current steel foundry operation. He emphasized that greater knowledge of product and of customer problems was an essential part of today's managerial responsibility.

Roy A. Foulke, Dun & Bradstreet, presented the subject of *"Ratios in Metal Industries."* He stated that major causes of business failures include too high an inventory in relation to working capital, excessive investment in fixed assets, top-heavy fixed debt or current liabilities, excessive salaries and/or dividends and excessive loans to subsidiaries or officers.

■ At the annual banquet, Monday evening October 24, President McDonald introduced Clarence Tolan Jr., formerly of Dodge Steel Corporation, Philadelphia, who was elected to honorary membership in the Society at the October 22 Board Meeting. McDonald expressed the appreciation of the membership to E. M. and R. M. Schumo of Pennsylvania Electric Steel Castings Co. for the Senior Memorial Trophy which was presented to the Society in memory of those steel foundrymen who had passed on.

S.F.S.A. market research and development program had full attention at the Tuesday morning session. A. M. Slichter, Pelton Steel Casting Co., chairman of the newly established market research committee, outlined both the value and the need for work in this field as a guide to individual steel foundrymen in making decisions about their own sales and operating policies.

"Ammunition for the Market" was the title of the remarks presented by H. D. Phillips, Adirondack Foundries and Steel Inc., Watervliet, N. Y., chairman of the technical research committee. He stated that S.F.S.A. had invested approximately a half million dollars since the war in this development and that the results are now evident in the 35 research reports which have been issued in the industry.

W. H. Muchnic, Locomotive Finished Material Co., Atchison, Kansas, chairman of the product and market development committee, selected *"Selling the Market"* as his topic and described the activities of his committee in this field. These included work in the field of market design, divisional product and market development programs, and an expansion of the product development contest.

W. H. Worrilow Jr., Lebanon Steel Foundry, Lebanon, Pa., chairman advertising, public relations and education committee, stated that American industry in 1954 spent over 8 billion dollars to convey its message to consumers and the public.

At the closing luncheon, Tuesday October 25, Earle M. Layman, General Steel Castings Corp., Granite City, Ill., chairman of the safety committee, stressed the need for human approach to safety problems. Following this talk, Mr. Layman and Mr. McDonald awarded the certificates for the S.F.S.A. 1955 safety contest.

Marketing panel. Left to right: A. M. Slichter, Pelton Steel Casting Co.; H. D. Phillips, Adirondack Foundries and Steel; W. H. Muchnic, Locomotive Finished Material Co.; W. H. Worrilow Jr., Lebanon Steel Foundry; F. K. Donaldson, SFSA.

Ohio Regional

Better Castings for Better Living

T. W. Curry: "solve problems through systematic study."

VERN CARLSON / *Technical Writer* and
PAUL R. FOGHT / *Assistant Editor*

■ Casting quality from pattern through finishing was featured at the Seventh Ohio Regional Foundry Conference. Three hundred and fifty representatives of the metal casting industry attended sessions at Case Institute of Technology, Cleveland, October 20-21, planned around the theme "Better Castings for Better Living".

The Regional was sponsored by five Ohio chapters of the American Foundrymen's Society in cooperation with Case Institute. The host chapter, Northeastern Ohio, drew heavily on Cleveland members to manage the conference. Heading arrangements was Lewis T. Crosby, Sterling Wheelbarrow Co.; Jack F. Wallace, Case Institute, was associate chairman; and Alexander D. Barczak, Superior Foundry, Inc., was program chairman.

Participating in the conference with specific program assignments, were the following Ohio chapters: Canton District–gray iron program, Central Ohio–malleable iron, Cincinnati District–non-ferrous, and Toledo–steel.

Conferees were welcomed to the campus at the opening session Thursday morning by T. Keith Glennan, president, Cast Institute of Technology, former member of the Atomic Energy Commission. Commenting on the recent international conference of atomic energy experts at Geneva, Switzerland, he told of the Russian exhibit that showed great activity in the field of metallurgy. He said they appear to be ahead of Americans in some developments.

President Glennan noted that Russia's particular interest in materials and physics is indicated by about 70 per cent of their students specializing in science and engineering. He paid tribute to the Foundry Educational Foundation for promoting engineering education of foundry field subjects.

Pilot foundry operations were discussed in the opening address, *"Applied Research and Development in the Foundry Industry,"* by T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va. He defined research as solving problems through systematic study, then described a casting section control campaign that was waged with a sand grain-fineness testing machine, a band saw, transparent plastic sheet, and some pattern shop work. Core sag was licked by making core mixes consistent through prevention of sand grain segregation in cylindrical storage with a specially developed orfice, and by measuring dry binders by weight instead of volume.

Curry pointed out that his plant's pilot foundry financially supports its full-time operation by evaluating new materials, products, processes, and equipment, minimizing problems that would crop up in production, and allowing the foundry to be in tune with the times and ready for tomorrow.

Curry credited a campaign to reduce tramp elements for closer control of hardenability, reduction of shrinkage defects, and reduction of frequency and severity of so-called unknown defects. Ti, Ni, Mo, Cr, Va, and Cu are more closely controlled than C and Si by calculating cupola charges with the following equivalents: SiE — Si + 2Ti, CuE — Cu + 2Ni, and CrE — Cr + Mo + 2Va. Curry concluded that from now on, studies involving metal analysis must include determination of tramp elements to be useful.

The opening session was presided over by Conference Chairman Crosby.

AFS President Bruce L. Simpson, National Engineering Co., Chicago, pointed out at the luncheon that people cannot progress while living by themselves, and that with service to others through AFS activities, individuals receive training and advancement.

Simultaneous sessions were held Thursday afternoon and Friday morning for gray iron, malleable, steel, and non-ferrous groups. One of two gray iron speakers, Thursday, was William J. White Shallway Corp., Connellsville, Pa.; the other was Karl G. Presser, Gray Iron Research Institute, Inc., Columbus, Ohio. White spoke on *"Shell Molding and Shell Cores;"* Presser's subject was *"Cupola Operation."* W. W. Snodgrass, Massillon Steel Castings Co., Massillon, presided.

In reviewing the development and growth of shell molding, White, predicted the transition to shell cores would be quicker due to accumulated experience and wide spread applications of the process to molding. He noted that the larger the core the greater the savings involved in converting to shell.

Analyze the cupola, advised Presser, study it and its operations and you can standardize conditions and be able to meet changes in iron and in customer demands. He recommended coke ratios be determined

CASE INSTITUTE PHOTOS

Registration starts as first of 350 Ohio conferees sign in.

Conference leaders L. T. Crosby, left, and A. D. Barczak talk it over.

from a daily cupola log sheet that includes measurements of minimum cupola diameter and the bed, plus a record of material in the charge and temperature readings.

"Safety" was the subject of A. C. Hensel, Albion Malleable Iron Co., Albion, Mich., first speaker of the afternoon malleable session. His chairman was A. J. Stone, Battelle Memorial Institute, Columbus. The second speaker, R. A. Witschey, A. P. Green Fire Brick Co., Mexico, Mo., spoke on *"Refractories for Malleable Melting and Annealing."* N .H. Keyser, Battelle, presided.

You may think you're losing only the time of an injured employee, but Hensel assured that every person aware of the accident was also losing time. He said the cost of his company's self-insured safety program and accident compensation is considerably less than liability insurance. Hensel credited their vigorous safety program for reducing employee turnover and attracting better workers.

Witschey discussed classes and forms of refractories and specific applications in the annealing oven, air furnace, and electric furnace. For electric furnace malleable melting, he recommended fire clay refractory in arch construction, sidewalls, and bottom—with super-duty and high alumina standard shapes together with special shapes around electrode openings. Rammed refractory shou dlbe used around the center sections, he stated.

At the afternoon steel session conferees heard John B. Caine, consultant, Cincinnati, speak on *"Steel Castings vs Forgings,"* with John G. Blake, Alloy Founders, Inc., Toledo, presiding. Also heard was Arthur F. Gross, Ohio Steel Foundry Co., Springfield, speaking on *"Melting Practice for Quality Steel Castings,"* with Bernard J. Beierla, E. W. Bliss Co., Toledo, as chairman.

Criticizing the practice of comparing castings with forgings on the basis of tensile strength, Caine declared tensile ductility to not only under evaluate cast metals, but also to over evaluate wrought metals. He pointed out ample evidence that metal structures with good tensile properties fail with brittle fracture.

Caine recommended service strength be measured by means of notch toughness and fatigue strength. This, he observed, puts emphasis on quenching to develop notch toughness and eliminating crack-like defects for better fatigue strength.

Speaking at the non-ferrous session were two generations of the Ball family. William M. Ball, Jr., R. Lavin & Sons, Inc., Cincinnati, spoke on *"The Elimination of the Most Common Defects Found in a Non-Ferrous Foundry;"* his son William M. Ball, III, Hill & Griffith Co., Cincinnati, followed him with a talk on *"Some New and Different Ideas Pertaining to Non-Ferrous Synthetic Sands."* Chairman for both speakers was Gerald L. Brunsman, O. P. W. Corp., Cincinnati.

Ball, Jr., reminded the group that they may not be applying foundry techniques which are proven to give best results. He singled out metal contamination as probably the greatest cause of defective castings and those unable to meet specifications. This he blamed on carelessness with scrap, melting procedures, and temperature control.

Ball, III, discussed, among several aspects of synthetic non-ferrous sand, the use of thermal stabilizers (cellulose materials) in amounts up to about 2 per cent (by weight) for increasing flow ability, better peel, and control of expansion-type defects. He recommended a 10-ram green compression strength of 30 as a minimum for eliminating common defects of dirt, scabs, swells, and erosion.

Banquet speaker, P. R. Reid, Ford Motor Co., Detroit, asserted public opinion of American Business is based on the actions of businessmen. Because management actions of making judgements, initiating action, and getting results are accomplished through the field of human relations, Reid declared, it is imperative for management to understand people and to assist in solving social problems.

Friday morning gray iron session speakers were T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, and Michael Bock II, Exomet, Inc., Conneaut, Ohio. Barlow spoke on *"High Pressure Molding"* and Bock discussed *"Exothermic and Insulating Materials."* H. A. Biddinger, F. E. Myers & Bros. Co., Ashland, was session chairman.

Barlow disclosed the most recent development in pressure molding to be a combination of the CO_2 process of curing with the diaphragm method of pressure molding. He illustrated how the mold is gassed through probes attached to the pattern plate and through vents in the pattern. Barlow foresaw applications of this combination to those jobs that require dry sand molds due to difficulty in drawing the pattern or where excessive errosion is experienced on pouring.

Bock demonstrated riser sleeves of exothermic and insulating materials. His slides of applications showed advantages of insulated risers over standard risers in improved casting soundness, increased yield, reduced heat loss by convection and radiation.

At the malleable session Emil J. Romans, National Malleable & Steel Castings Co., Cleveland, discussed *"Casting Defects"* and Earl M. Strick Erie Malleable Iron Co., Erie, Pa., spoke on *"Malleable Iron Finishing."* Chairman for the first speaker was D. C. Williams, Ohio State University; Harry E. Grabel, Ohio Malleable Div., Dayton Malleable Iron Co., Columbus, presided for the second speaker.

Romans described a scrap reduction program facilitated by a simple card for each production run, on which the foreman records the condition of his equipment, material, and orderliness of the work area together with total production and scrap.

Better finishing to meet competition was called for by Strick, who pointed out the increase in the number of customers specifying casting finishes. He said it is necessary to do a better job at lower cost. Strick stated he obtains best results from a mixture of chilled iron shot and steel shot.

The steel session, occupied with casting yield, heard Harold Bishop, Naval Research Laboratory, Washington, D.C., speak on *"Procedures for Risering Steel Castings"* and John E. Gotheridge, Foundry Services, Inc., Columbus, Ohio, discuss *"Practical Applications for Moldable Exothermic Compounds in Steel Foundries."* Session chairmen, both from Unitcast Corp., Toledo, were M. J. Gruhler, Jr., and Lawrence King.

continued on page 80

foundry trade news

American Steel Foundries . . net income for fiscal year ended September 30 was $3,770,371, or $3.17 per share, on sales of $80,664,461. Last year's net was $3,626,688, or $3.05 per share, on sales of $89,013,926.

Whitehead Brass Foundry, Inc. . . now operating in new building at 80 Anthony St., Brooklyn, N. Y. All new equipment has been installed.

Walker Machine & Foundry Co. . . Roanoke, Va., firm has joined American Foundryman's Society. Franklin Moore is company president.

Aero Foundry Co. . . Gustave Reichenbach has retired and sold business to Paul Stibrany. Company continues at 335 W. 49th St., New York.

United States Graphite Co. . . division of Wickes Corp. will spend $600,000 to expand manufacturing and office facilities at Saginaw, Mich. Main investment will be an addition to present plant's carbon-finishing department.

Long Island City Bronze Foundry, Inc. . . this is the new name of Pete Brass & Bronze Foundry of Long Island City, N. Y. No other changes in company.

Pontiac Foundry Co., Inc. . . Non-Ferrous Founders' Society lists Fort Wayne, Ind. firm as new member.

Central Foundry Co. . . largest producer of cast iron soil pipe announces national advertising program. For the first time in more than 25 years this Newark, N. J., producer will have program including advertisements in national plumbing contractor trade magazines, sales promotion literature, selling aids, product catalogs and publicity.

National Malleable & Steel Castings Co. . . 75 cent dividend declared by Cleveland firm will bring total dividends for 1955 to $1.50 a share. Dividends for 1954 totaled $1.25.

Pekay Machine & Engineering Co., Inc. . . producer of sand conditioning machinery has added new production space to its plant in Chicago. Total space now nearly double original area.

Kaiser Steel Corp. . . west coast producer has signed contract for shipment of 110,000 gross tons of pig iron to Japan. Shipments will be made from Fontana plant through the Port of Long Beach, beginning in late November and extending for more than a year. Exported tonnage will not interfere with shipments to domestic customers and may relieve west coast sortage of scrap iron by taking Japan out of the market, Kaiser states.

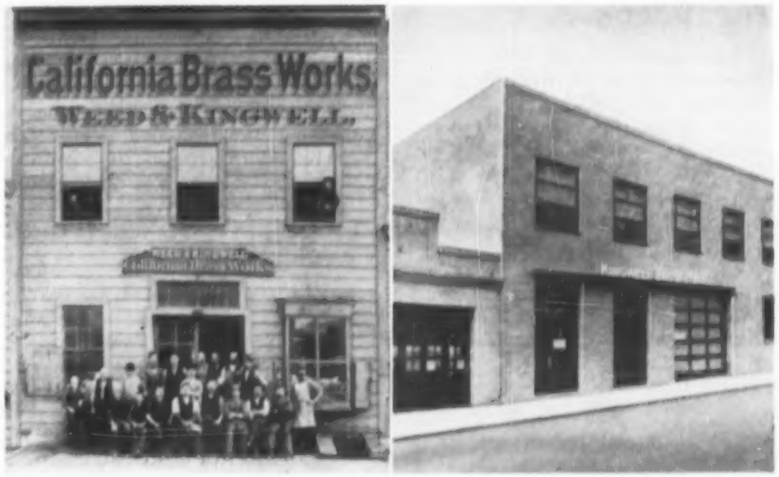
Syntron Co. . . R. L. Patterson has joined sales staff of Syntron Buffalo Sales Co. and Earl K. Gardner has been appointed district manager of Syntron Pittsburgh Sales Co., South Charleston, W. Va.

Union Metal Mfg. Co. . . Canton, Ohio, company has announced $1,000,000 expansion. New buildings and new equipment are included in program.

Toledo Pattern Shop Re-Named

Ohio Pattern & Mfg. Co. is the new name of Dewey Pattern Works, 26-year old Toledo supplier of wood and metal patterns to Ohio and other midwestern foundries. Simultaneously, Ohio Pattern becomes a division of Washtenaw Pattern Co., Wayne, Mich., with M. J. Giles as general manager of the Toledo company. No change in ownership or company officers is involved. Ohio will continue to specialize in foundry patterns and services, but will be equipped to do other highly specialized jobs, such as model work, according to Giles.

From Ship's Bells to Vital Bronze Parts



From padlocks for Wells Fargo money boxes, as well as fog bells for ships and bronze nozzels for the fire department, to vital bronze parts which are used by the aircraft industry—in a span of a century—is the history of Kingwell Bros., Ltd., San Francisco, celebrating their 100th birthday this year. Originally known as Weed & Kingwell or California Brass Works, old bills of the company carried the notation: "All kinds of steam, liquor, water, oil, flange cocks and valves made and repaired." Picture at left, above, shows the early Kingwell plant and at the right, a view of the modern Kingwell plant 100 years later.

for the asking

Electric Melting

"Electric Furnace Fume Control News," new publication on controlling dust and fume of electric steel melting furnaces, includes discussion of local exhaust ventilation and cloth filter collectors; performance data; photos of furnaces, hooding, ductwork show effect. *Wheelabrator Corp.*

CIRCLE No. 27, PAGE 81-82

Molding Machines

16-page bulletin 5111 has photographs, discussion, drawings, specifications of J & J portable and stationary jolt rollover pattern draw, rollover pattern draw, jolt pinlift, jolt squeeze pin-lift, jolt squeeze, and plain jolt machines. *Beardsley & Piper Div., Pettibone Mulliken Corp.*

CIRCLE No. 28, PAGE 81-82

Core & Mold Ovens

16-page bulletin 53-CM illustrates and discusses rack, car, vertical, horizontal monorail, rolling drawer, portable, and special ovens; also ingot mold dryers and heat treating furnaces. *Carl-Mayer Corp.*

CIRCLE No. 29, PAGE 81-82

Strainer & Breaker Cores

4-page bulletin illustrates and describes refractory strainer and breaker cores that save time and money and reduce breakage. Volume of metal passed at various head pressures is given; sizes are recommended for applications. *Louthan Mfg. Co.*

CIRCLE No. 30, PAGE 81-82

Pattern Shop Machinery

Oliver line of woodworking machines included in 8-page folder are disc and spindle sanders, circular and band saws, lathes, surfacers, milling machines, embossing presses, benches, vises, and tool grinders. *Oliver Machinery Co.*

CIRCLE No. 31, PAGE 81-82

Shell Molding System

8-page book 2462 describes fully integrated automatic shell molding system capable of producing 240 molds/hr. 4-station machine, closing machine, all process equipment from sand preparation to handling finished castings has been proven in volume production. *Link-Belt Co.*

CIRCLE No. 32, PAGE 81-82

Sand Conditioner

Bulletin describes the Sand Hog, self feeding, self propelled, magnetic scrap removal, moisture distribution through blending and aeration, says don't haul sand around the foundry, take Sand Hog to the sand. Illustrations, specifications, discussion. *Royer Foundry & Machine Co.*

CIRCLE No. 33, PAGE 81-82

Bentonite Characteristics

Brochure describes source and use and results from using National Bentonite. Includes mineralogical composition, chemical analysis, physical properties; discusses swelling and mechanically held moisture. *Baroid Div., National Lead Co.*

CIRCLE No. 34, PAGE 81-82

Core and Mold Wash

Bulletin gives instructions for use and application of Blackoat S-5 for work in gray or malleable iron. Says it is used at a lower Baume than other plastic wash; may be sprayed, dipped, swabbed or brushed. Working sample available. *Delta Oil Products Co.*

CIRCLE No. 35, PAGE 81-82

Offers Services

10-page pamphlet describes company's foundry services: chemical and spectrographic analysis; physical and metallographic testing; metallurgical consulting, heat treatment, investigation of material failures and preparation of evidence; metal mixtures, cupola operations, metallurgical and sand control, plant layout, and pattern and equipment layout and design. *Charles C. Kawin Co.*

CIRCLE No. 36, PAGE 81-82

Vacuum Degasser

Kinney Mobile Vacuum Degasser, designed for the foundry industry is described in Bulletin 402. Is said to greatly reduce porosity, result in cleaner castings, eliminate flushing, improve physical properties of casting, utilize lower grade secondary metals, eliminate impregnation, and requires no special skill. *Kinney Mfg. Div., New York Air Brake Co.*

CIRCLE No. 37, PAGE 81-82

Cast Iron Art

Handsomely printed, 14-page booklet presents the Lamprecht Collection of Cast Iron Art; a story of cast iron in its more beautiful and esthetic form.

Illustrated are 18th century stove, jewelry, portraits, busts, and household articles. Originally published in 1941 by American Cast Iron Pipe Co., made available by *United Oil Mfg. Co.*

CIRCLE No. 38, PAGE 81-82

Plastics Line

"Facts File on the big Monsanto family of plastics" describes, among their products, Resinox phenolic plastic for shell molding and core binding, and grinding wheels. Lytron sand conditioner for reducing clayballing and for more economical and cleaner castings. *Monsanto Chemical Co.*

CIRCLE No. 39, PAGE 81-82

Roller Conveyor Bearing

Bulletin describes Logan standardization on X-bearing said to have low friction, be extra quiet, have high efficiency on conveyor rolls. Foundry application is illustrated. Available with seals for dust protection, grease packed, or on pressure lubricated rolls. *Logan Co.*

CIRCLE No. 40, PAGE 81-82

Air Vibration Equipment

Catalog No. 109 features the Cleveland line of air vibration equipment. This includes 29 mountings and 14 piston diameters in a wide range of vibration intensities. *Cleveland Vibrator Co.*

CIRCLE No. 41, PAGE 81-82

Thermocouple Protecting Tubes

Full list of standard, off-the-shelf, Serve-Rite thermocouple protecting tubes and protecting wells appear in bulletin Form 11-13. Specifications and general application data are given. *Claud S. Gordon Co.*

CIRCLE No. 42, PAGE 81-82

Refractory Application Directions

How to use Luxit high grade refractory in the cupola melting zone, crucible, breast and slag hole; in insulated, receiving, transfer, and pouring ladles. Bulletin AL-28 claims this material involves less labor, less slag, no joints or cracks, and longer life. *Alpha-Lux Co., Inc.*

CIRCLE No. 43, PAGE 81-82

Metal Abrasive

Recommendations for the use of Harrison Chilled Shot and Harrison Diamond Grit are presented in Bulletin 521 which says a critical appraisal of abrasives includes: work speed, finish produced, uniformity of abrasive, and overall costs. *Harrison Abrasive Div., Metals Disintegrating Co.*

CIRCLE No. 44, PAGE 81-82

Nickel Austenitic Ductile Irons

Technical paper with this title says ductile Ni-Resist iron combines strength and ductility of ductile cast iron with corrosion and heat resistance and metal-to-metal wear of conventional Ni-Resist castings. Present and potential industrial applications are presented. *International Nickel Co., Inc.*

CIRCLE No. 45, PAGE 81-82

Improved Spectrometers

Bulletin 44 describes improved models of Direct Reading Spectrometers featuring Automatic Servo Monitor. States that Monitor increases optical

stability and reduces errors in analysis. Clock indicators calibrated directly in per cent concentration on logarithmic scale are said to be accurate over wide range. *Baird Associates, Inc.*

CIRCLE No. 46, PAGE 81-82

Bulk Conveyors

12-page bulk conveyor catalog describes bulk conveyors for handling coal, ashes, sand, gravel, stone, chips, aggregate, etc. Drawings of head and tail ends, cross sections, drive, and takeup units are shown. *Jervis B .Webb Co.*

CIRCLE No. 47, PAGE 81-82

Protective Helmets

A line of Skullgard protective helmets is described in Bulletin 0600-3. Along with descriptions of reinforced and high-pressure plastic headgear, are descriptions of hats made of glass fiber and aluminum. *Mine Safety Appliances Co.*

CIRCLE No. 48, PAGE 81-82

Automatic Pyrometers

4-page Bulletin G-8 lists standard ranges and specifications of Simplytrol automatic pyrometers for control of temperature in furnaces and ovens. Ordering information and some accessories are included. *Assembly Products, Inc.*

CIRCLE No. 49, PAGE 81-82

Masonry Blades

New Niagara line of masonry blades is described in 4-page bulletin A-1308. Included are information of blade types and sizes, applications, a comparative grade chart, description of blade identification system, and ordering information. *Carborundum Co.*

CIRCLE No. 50, PAGE 81-82

Core Box Blow Seal

"Stopping Blow-By in Core Boxes" tells how a dike-type blow box seal prevents blow-by, reduces patching, eliminates damage to box face, and makes coremaking safer. *Dike-O-Seal, Inc.*

CIRCLE No. 51, PAGE 81-82

Exhaust Fans

New Catalog 6514 outlines the construction features of the new Model K Ventura Fans for industrial heavy-duty exhaust applications and explains their significance. Performance data

such as delivery ratings at various static pressures, fan speed, motor horsepower, quietness rating, and maximum net weight are given for each of 45 units in the Model K line. *American Blower Corp.*

CIRCLE No. 52, PAGE 81-82

Furnace & Oven Controls

New price list and specification catalog (48-page Bulletin P1260) for Furnace and Oven Control Instruments and Accessories contains detailed specifications and engineering data for choosing proper pyrometers and control equipment for heat-treating, metal processing, or other heating application. *Bristol Co.*

CIRCLE No. 53, PAGE 81-82

Thermocouple Catalog

56-page Bulletin P1238 is a buyer's guide and user's manual on thermocouples and pyrometer accessories. It contains extensive engineering data on the selection and installation of thermocouples, wells, head assemblies, and accessories. *Bristol Co.*

CIRCLE No. 54, PAGE 81-82

casting through the ages

Vibrating Conveyor

New Oscilveyor vibrating conveyor is illustrated and described in bulletin which also lists ten major advantages of the Oscilveyor and 41 products that can be successfully handled by this conveyor. *Gifford-Wood Co.*

CIRCLE No. 55, PAGE 81-82

Temperature Measurement

"How Temperatures are Measured" discusses heat and temperature as separate concepts; tells the history of commonly used scales for measuring temperature; and describes physical effects associated with a rise in temperature. *Tempil Corp.*

CIRCLE No. 56, PAGE 81-82

Dustless Pitch

Hygeia Dustless Pitch is described in leaflet that asks you to compare the scatter pattern of your pitch with that of Hygeia. Results of a similar comparison are given. *Penn-Rillton Co.*

CIRCLE No. 57, PAGE 81-82

Basic Lining Practice

"Operating Practices with the Basic-Lined Cupola" explains the mechanics of basic slag systems, lining and maintenance procedures, process advantages operating difficulties and their corrective measures. *Basic Refractories Inc.*

CIRCLE No. 58, PAGE 81-82

Metallographic Machines

Line of rugged, heavy duty Selecto-Speed metallographic polishing machines is described in Vol. 1 No. 4 "AB Metal Digest." Modern optical-type speed selector for infinitely variable speed control between 100-1200 rpm and other advanced features are described. *Buehler Ltd.*

CIRCLE No. 59, PAGE 81-82

Chain Hoist Catalog

New CM Lodestar electric chain hoist designed for low maintenance is described in 12-page Catalog 158. Hoists are available in capacities from 1/8 to 1 ton for operation on 115 volt and 208-220 440 volt power. *Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.*

CIRCLE No. 60, PAGE 81-82

Vertical Storage

Super-Concrete Stave Storage Bins are featured in bulletin that describes the material, construction, and capacities of this type of vertical storage. Firm states that their background in materials handling allows them to aid in the selection and location of handling machinery. *Neff & Fry Co.*

CIRCLE No. 61, PAGE 81-82

Pins and Bushings

New Flask Pin and Bushing Catalog, F-1030, features standards in plain, tapered, round, hexagon, and threaded series. Also tells how carburized and hardened wearing surfaces with ductile cores give extremely long life. Complete specification tables included. *Universal-Engineering Co.*

CIRCLE No. 62, PAGE 81-82

Shell Core Blower

Chicopee "Core Chief" Model SCB2 is described in a 4-page bulletin that says heaters in coreboxes are unnecessary, it handles two coreboxes (similar or not) simultaneously, foot operated valve opens oven doors thus freeing operator's hands. Saves drier, equipment, and storage costs. *Shell Process, Inc.*

CIRCLE No. 63, PAGE 81-82

Cut-Wire Shot

Harrison L/D Shot, says Bulletin 522, last longer than cast shot (as cast or heat treated), has uniform size not obtained in screened shot, (uniform hardness avoids spotty results in cleaning, and lower costs for abrasive, consumed, labor, maintenance, storage. Specifications for steel L/D shot are presented. *Harrison Abrasive Div., Metals Disintegrating Co.*

CIRCLE No. 64, PAGE 81-82

Refractory Line

The Ironton line of refractories is presented in their Technical Bulletin File D, No. 4. Included are: high temperature cement, dry press brick, plastic form fire brick, refractory concretes, and insulating refractory concretes. *Ironton Fire Brick Co.*

CIRCLE No. 65, PAGE 81-82

Electric Utilities & Melting

"Electric Utilities and the Electric Furnace" are featured in the September issue of Carbon and Graphite News. Covered are the beginnings and development of electric furnace use, electric power for arc furnace operation,

plus a look into the future. Second article deals with carbon as a cupola refractory with applications in front slagging spout, well, and tap hole. *National Carbon Co.*

CIRCLE No. 66, PAGE 81-82

Induction Melting

Illustrated report tells how a foundry making centrifugal castings up to 60,000 lb widened the range of materials handled by installing high-frequency induction melting units. They now cast stainless, carbon, alloy, and special high alloy steels as well as nonferrous alloys. *Ajax Electrothermic Corp.*

CIRCLE No. 67, PAGE 81-82

Thermocouple Circuit Checker

Restorer is a device for correcting inaccurate temperature reading and control caused by thermocouple circuit failure during heat treating and melt operations. Catalog R-22 discusses plant applications, and operation. *Peerless Electric Co.*

CIRCLE No. 68, PAGE 81-82

Indicating Pyrometers

Three models of Wheelco indicating pyrometers, available in ranges up to 3600 F, are described in Bulletin F-6048-1. Combination indicating pyrometer and multiposition switch is also described. *Barber-Colman Co.*

CIRCLE No. 69, PAGE 81-82

Shell Molding

5-page reprint CDC-255 "Shell Molding Comes of Age", tells the history of shell molding, discusses its continuing acceptance and why, then treats each phase of the process with description and illustrations. *General Electric.*

CIRCLE No. 70, PAGE 81-82

Vibrating Conveyor

15-page Bulletin 39 describes the LO-Veyor line of vibrating conveyors. Conveyor is only 14 in. high, is self contained and easily installed, has no exposed rotating bearings, and has low power requirements. *Ajax Flexible Coupling Co., Inc.*

CIRCLE No. 71, PAGE 81-82

Mullite Refractories

New, 24-page catalog 102 on Shamva Mullite brick and special shapes illustrates typical installations, gives performance data, specifications and properties of six types of Shamva. Research and quality control are included. *Mullite Refractories Co.*

CIRCLE No. 72, PAGE 81-82

Safety Honors Go To Malleable Founders

C. L. Liebau, right, accepts plaque from D. L. Arm, National Safety Council.

■ Malleable Founders' Society was presented the National Safety Council's highest award for association safety activity during the National Safety Congress in Chicago. The society was recognized for its outstanding reduction in injury frequency rates and for general excellence of its safety program for the industry.

Injury frequency in the malleable industry has been reduced 50 per cent in the past five years with 28 per cent of this gain being made in the last year. The Malleable Founders' Society program which resulted in this reduction includes: special contests and awards for companies in several size groups, safety bulletins containing helpful suggestions on safety promotion and elimination of accident causes, and the publication of injury frequency rates and the analysis of the reporter's rates for comparative purposes.

The malleable group was also one of several associations providing educational exhibits of safety publications and service during the Safety Congress at the Hilton Hotel October 17 to 21.

A total of 11 associations which did outstanding work in preventing occupational accidents during 1954 were cited at the meeting, the 43rd national meeting and exposition held by the Safety Council.

Trade Safety Ideas

Associations looking for ideas for the expansion of their safety programs, as well as those interested in safety as a new activity, had an opportunity to exchange information at a series round tables during the Congress. Six topics were discussed in these round tables including: *How to Get Started With a Safety Program, Evaluating Accident Problems,* and *Publications and Technical Service.*

Metal castings industry representatives in addition to the Malleable Founders were: E. W. Burne, General Electric Co., Schenectady, N.Y., chairman of the national safety committee of Gray Iron Founders' Society; Herbert J. Weber, director of safety, hygiene, and air pollution control for American Foundrymen's Society, and Erwin Dieckmann, coordinator of safety activities, Steel Founders' Society of America.

Ohio Regional

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Bishop showed how riser feeding range data was applied to determining riser locations and how, in one casting, chills were applied to increase feeding range. He illustrated the method of using charts for determining riser dimensions and showed approximations that aid in using risering charts.

According to Gotheridge, steel casting yields near 90 per cent may be achieved with suitably designed, exothermic-lined risers amounting to a minimum of 20 per cent of the casting. Gotheridge warned that water content of moldable exothermic compounds is critical, and that over mixing and over ramming effect ignitability.

The Friday morning non-ferrous session included *"Gating and Risering of Non-Ferrous Castings"* by Charles V. Knobeloch, R. Lavin & Sons Inc., Baltimore, Md., *"The CO_2 Process"* by James Reedy, Delhi Foundry Sand Co., Cincinnati, Ohio. Presiding was Charles E. Koehler, Hamilton, Brass & Aluminum Castings Co., Hamilton.

Knobeloch described the dross of manganese bronze as extremely abrasive clinkers and that of aluminum bronze as a soapy foam. To reduce turbulence-created dross he recommended horn gating into the bottom of the mold cavity or using tangential gates. On the other hand, Knobeloch noted that the time of metal-oxygen contact (which produces dross) can be greatly reduced by top pouring into strongly constructed molds. In the latter case metallic chills at the cavity base will prevent mold destruction, he advised.

Among advantages of the CO_2 process noted by Reedy were: coremaking time is less; curing against the pattern insures dimensional accuracy and eliminates many green strength additives, also wires and gaggers; fewer ingredients in the sand to be controlled, to give off fumes, to reduce mold permeability—making possible the use of finer sands for improved finish; less investment in equipment and floor space. Disadvantages, according to Reedy, are short bench life, requiring mixed sand to be stored in closed containers. Also, help must be re-educated.

R. Clark, Bell Telephone Co., Cleveland, amazed conferees at the Friday luncheon with tales of the transistor in *"Something New in Communications."*

A final joint meeting in the afternoon featured *"Patternmaking"* by George W. Schuller, Jr., Caterpillar Tractor Co., Peoria, Ill. A. D. Barczak, Superior Foundry, Inc., Cleveland, was session chairman.

Schuller stated that there is no good, cheap pattern. He recommended that when a pattern is being designed, a conference be held among interested departments to anticipate difficulties in molding, pouring, and future operations. He also advised keeping a record of results with different shapes of castings.

The following were in charge of group programs: gray iron—H. A. Biddinger, F. E. Myers & Bros. Co., Ashland; malleable iron—N. H. Keyser, Battelle Memorial Institute, Columbus; non-ferrous—John D. Sheley, Black-Clawson Co., Hamilton; steel—Charles E. Eggenschwiler, Bunting Brass & Bronze Co., Toledo.

The conference arrangements committee of Cleveland-area men consisted of: Jack F. Wallace, Case Institute of Technology; Norman J. Stickney, Sand Products Corp.; Howard E. Heyl, Federal Foundry Supply Co.; E. Claud Jeter, Ford Motor Co.; Wayne C. Johnson, Walter C. Best, Inc.; Emil J. Romans, National Malleable & Steel Castings Co.; and John H. Sibbison, Kerchner-Marshall & Co.

Conference treasurer was Harold R. Strater, North American Refractories Co., Cleveland. Publicity director was Robert H. Herrmann, *Foundry*, Cleveland.

Representing the sponsoring chapters were the reception committee: Kenneth Clark, Hill & Griffith Co., Cincinnati; Leroy F. Schultz, Freeman Supply Co., Toledo; D. C. Williams, Ohio State University, Columbus; from Cleveland—Gilbert J. Nock, Nock Fire Brick Co.; William G. Gude, *Foundry;* and S. N. Farmer, Sand Products Corp.; and Thomas H. Brown, Federal Foundry Supply.

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MODERN CASTINGS

Golf & Wolf Roads

Des Plaines, Illinois

New England Regional

continued from page 67

heat loss by convection and radiation with standard risers and with insulated risers. Insulated risers, he said, can be smaller and result in better castings.

The conference closed with a dinner planned by local representatives of foundry supply companies.

In addition to Stenberg, Nye, Armstrong, Volpe, and Ferrari, the following served on the conference committee: Alexander Beck, Whitman Foundry, Inc., Whitman, Mass.; Frank Benoit, Brown & Sharpe Mfg. Co., Providence, R.I.; Thomas I. Curtin, Jr., Waltham Foundry Co., Waltham, Mass.; Joseph Burke, Lowell Iron Foundry, Lowell, Mass.; Ahti Erkkinen, Builders Iron Foundry, Inc., Providence, R.I.; Henry M. Frechette, Fitchburg Foundry, Inc., Fitchburg, Mass., James Hamblin, Saco-Lowell Shops, Biddeford, Me.; Fred Holway, Mystic Irons Works, Everett, Mass.; Charles W. Hutchins, Standard Foundry Co., Worcester, Mass.; William Hale, Springfield Foundry Co., Springfield, Mass.; Warren Murdock, Acme Foundry Co., Inc., Chelsea, Mass.; William Naughton, Whitehead Brothers, Providence, R.I.

Other committee members were: Albert M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass.; Daniel Pendergast, Sterling Wheelbarrow Co., Boston, Mass.; Harold Prindle, New England Coke Co., Boston, Mass.; C. P. Randall, Hickman Williams & Co., Boston, Mass.; Harry Sleicher, Seaboard Foundry, Inc., Providence, R.I.; Prof. Howard F. Taylor, MIT, Cambridge, Mass.; Alexander S. Wright, Springfield Facing, Inc., Willamanset, Mass.; C. A. Wyatt and John H. Orrok, Debevoise-Anderson Co., Inc., Boston, Mass.; Herbert H. Klein, Klein-Farris Co., Boston.

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NAME

TITLE

COMPANY

ADDRESS

CITY AND ZONE

David E. Davidson

G. E. Seavey

C. R. Heller

FEMA Members Optimistic

■ Optimism prevailed at the 37th annual meeting of the Foundry Equipment Manufacturers Association held at the Greenbrier, White Sulphur Springs, W.Va., October 13-15.

In addition to holding product group meetings, discussing business statistics, and holding other policy sessions, officers were elected for the coming year. They are: president, David E. Davidson Link-Belt Co., Chicago, and vice-president G. E. Seavoy, Whiting Corp., Harvey, Ill. C. R. Heller, Washington, D.C., was re-elected executive secretary-treasurer.

Three new members were added to the board of directors: R. A. Brackett, Spencer Turbine Co., Hartford, Conn.; Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh; and C. R. Sare, W. W. Sly Manufacturing Co., Cleveland.

General meetings opened the second day with William B. Wallis, Pittsburgh Lectromelt Furnace Corp., FEMA president, presiding. Executive Secretary Heller reported on the activities of the group's headquarters organization.

The first day closed with a reception honoring President and Mrs. Wallis, and the annual banquet.

Vice-President Davidson presided over the final day's sessions which featured a report on activity in the foundry equipment industry and a speech describing *"What Foundry Management Expects of the Foundry Equipment Industry."*

Einar A. Borch, chairman of the association's statistical committee, reported that most FEMA member firms reported larger backlogs on September 1 than they reported January 1. Mr. Borch also observed that firms manufacturing foundry equipment exclusively sell the greater part of their output to small foundries with less than 100 employees. Companies with diversified lines selling to other industries in addition to the metal castings industry sell the bulk of their output to larger foundries, he said.

National Casting Council activities were reported by Frank G. Steinebach, Penton Publishing Co., NCC secretary.

Reporting on the Foundry Educational Foundation, Executive Director E. J. Walsh discussed the importance of the foundation to the industry. Walsh cited the growing castings market and warned that the castings industry can lose its fair share by failing to take advantage of advances in foundry technology, and in better trained personnel.

Frank X. Bujold, Ford Motor Co., was the principal speaker of the meeting. (His complete remarks appear on pages 58-59 of this issue.) He outlined new developments that the industry will require from the equipment manufacturers.

Bujold outlined the job he feels the seller of equipment must do to support his equipment. The seller must train the purchaser in the maintenance and use of his equipment and must support the equipment with a service organization and maintenance information, he said.

Members of the annual meeting committee that organized the three-day program were: L. F. Miller, Osborn Mfg. Co., Cleveland, *chairman*; R. J. Hines, Hines Flask Co., Cleveland; and H. G. Schlichter, Beardsley & Piper Div., Chicago.

Defense Materials System

"The Defense Materials System in Our American Industry" has been published by the Business and Defense Services Administration, U. S. Department of Commerce, to aid industrial contractors and subcontractors for programs of the Department of Defense and the Atomic Energy Commission in acquainting themselves with specific rules and regulations. It has been arranged so that each type of contractor and supplier may find a handy reference to the general rules applicable to his defense contract operations.

Key questions and answers on the essential points of the Defense Materials System precede the detailed description and instructions for defense contractors. The 41-page booklet may be obtained through the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25 cents a copy.

Chicago Chapter photos by Fred Ridenour, Whiting Corp.

Chicago . . Dean Trezise, Professor R. W. Schroeder and 30 new AFS student members with scholarship plaque.

local foundry news

Chapter president J. T. Moore presents check to Dean Trezise.

J. A. Rassenfoss gives award to U. of I. Freshman Damico.

Present Robert E. Kennedy Scholarship

■ Award of the second annual Robert E. Kennedy Scholarship was made during Robert E. Kennedy Night, the November 7 meeting of the Chicago Chapter.

The Chicago Chapter of AFS established the Robert E. Kennedy Scholarship at the Navy Pier Branch of the University of Illinois in 1954. The award is intended to provide an annual scholarship for a student "selected for this honor on the basis of character, ability, interest in work related to the foundry industry and financial need."

Albert G. Damico, Jr., freshman at the Chicago campus, received this year's award from chapter past president J. A. Rassenfoss.

Robert E. Kennedy, in whose honor the scholarship is given, was secretary emeritus of the American Foundrymen's Society and secretary of the AFS Alumni Group at the time of his death, August 7.

Known as "Bob" to thousands of foundrymen, he was considered the "father of the AFS chapter movement."

Presentation of the award to a student of the University of Illinois recognizes Kennedy's association with that institution. He taught at Illinois from 1921 to 1928 while carrying on AFS staff activities, then rejoined the faculty in 1946 to develop foundry and pattern courses and laboratory facilities after retiring from AFS.

The scholarship is financed by the income from an endowment fund that now totals over $6300. The initial endowment was $5000 which was established with funds withdrawn from the accumulated surplus of the Chicago chapter. At the time of Kennedy's death, the chapter contributed an additional $500. To this has been added over $800 contributed in his memory by individuals throughout the country. The additional fund was presented to Fred W. Trezise, associate dean of engineering, University of Illinois, on Robert E. Kennedy Night.

"Permanent Molding of Aluminum Alloys" was the title of a talk presented by Leslie Armstrong, U. S. Reduction Co., East Chicago, Ind., at the non-ferrous session. The process, commonly called permanent mold casting, should be called gravity die casting, he said, while "die casting" may be referred to as pressure die casting. Armstrong outlined requirements for casting design, mold design and construction, casting alloys, and foundry practice for use of aluminum in these processes.

Speaking on *"Manufacture and Application of Foundry Coke,"* Clarence Holmes, Citizens Gas & Coke Utility, Indianapolis, Ind., explained to the gray iron group that although foundry coke represents only four per cent of metallurgical coke produced, almost all of the four per cent is produced by firms specializing in cupola fuel. He said the producers best control over final product was careful selection and blending of raw materials.

"Are You Working in the Dark?" was the subject of Carl W. Zersen, Chicago Lighting Institute, at the Maintenance Div. session. Technical chairman was R. E. Wozniak, National Malleable & Steel Castings Co. Mr. Zersen gave as principles of good lighting: no harsh shadows, no sharp contrasts, freedom from glare, and sufficient light. Good lighting, he said, increases safety, reduces fatigue and errors, gives higher productivity, and improves housekeeping.

Foundry Sands were discussed by Bradley Booth, Carpenter Bros., Milwaukee. The audience for his description of sand problems and sand characteristics was drawn from the chapter's steel and malleable division.

Texas

The October 28 meeting of the Texas Chapter was held at the Menger Hotel. J. R. Hewitt, Texas

Northern California . . *Shown at a recent meeting of the chapter are, left to right: Ivan Johnson, Pacific Steel Castings; Bruce Simpson, national president of AFS; Hans J. Heine, AFS technical director; and W. S. Gibbons.*

Foundries, Inc., presided, and W. A. Bearden, M. A. Bell Co., served as technical chairman.

J. O. Musick, Texas State Safety Assoc., spoke on *"Safety Practices in the Foundry Industry."* Mr. Musick functioned both as principal speaker and moderator of a panel composed of J. P. Hunter, Texas Foundries; H. M. Sanders, Employees Casualty Co.; Baxter Grier, Alamo Iron Works; Sam Forsgard, Western Foundry; and Conrad Flinn, Texas Steel Co. Some of the major topics covered were: eye accidents vs safety goggles, prevention of fatigue, increasing trend of back injuries, selling safety to supervisors, the first fundamental of an accident prevention program, safety education, and management benefits from safety programs.—*J. S. Ahrens, National Carbon Co.*

Northeastern Ohio

Approximately 200 members and guests of the Northeastern Ohio Chapter assembled at Tudor Arms Hotel, Cleveland, October 13, to participate in a diversified program of special interest to ferrous and non-ferrous foundrymen and patternmakers. Lewis T. Crosby, Sterling Wheelbarrow Co., chapter chairman, presided.

At the non-ferrous session, A. H. Hinton, Aluminum Co. of America, served as chairman and introduced Walter E. Sicha, also of Alcoa, who presented background information relating to the AFS sound-color film, *"A Study of Vertical Gating."*

Charles Schneider, National Malleable & Steel Castings Co., addressed the ferrous session on *"Developing New Ferrous Casting Business,"* and C. W. Forestek, Forestek Plating & Mfg. Co., Cleveland, discussed *"Hard Chrome Plating of Aluminum."*—*Jack C. Miske, Foundry.*

Saginaw Valley

Dr. Mead Killion, consulting psychologist on the staff of Rohrer, Hibler & Replogle spoke on *"The Normal Personality"* at the first meeting of the current season at Fischer's Hotel, Frankenmuth, on October 6. Technical chairman was A. T. Peters, Dow Chemical Co.

During the meeting Woodrow W. Holden, Dostal Foundry & Machine Co., retiring chairman, was presented with a plaque in recognition of his service by F. P. Strieter, Dow Chemical Co. current chairman—*R. G. Brown, Dow Chemical Co.*

Eastern Canada

Mount Royal Hotel was the scene of the October 14 meeting of the Eastern Canada Chapter. William Dunn, Western Pattern Works, presided, and Claude Bourassa, Archer-Daniels-Midland Co. (Canada) Ltd., was the technical chairman.

John Perkins, Ford Co. of Canada, spoke on *"Modern Foundry Practice."* He opened his talk on the great strides being taken by the foundry industry in the field of automation. To substantiate his statement, he quoted an article from the Detroit *Free Press* that was headed *"Automation Aids Small Plants Too."* Mr. Perkins then showed a film depicting a Ford Motor Co. foundry located in Cleveland.—*Thomas Niven, Canadian Car & Foundry Co.*

Tennessee

The annual outing of the Tennessee Chapter was held on September 10 at Camp Columbus on Chickamauga Lake. Six hundred members and guests attended. Highlight of the affair was the excellent barbecue prepared by T. A. Johnson, Somerville Iron Works, who was chairman of the Picnic Committee. A drawing was held for several dozen attendance prizes donated by foundry suppliers in the area. —*Joseph F. Delaney, Eureka Foundry Co.*

Timberline

The October 10 meeting of the Timberline Chapter was held at the Oxford Hotel, Denver, Colo. Bill Manske, American Manganese Steel Div., American Brake Shoe Co., presided, and Darrell Durant, U. S. Foundries, Inc., was the technical chairman.

Kermit A. Skeie, Magnaflux Corp., spoke on *"Castings Design."* He used slides to illustrate his talk, emphasizing the fact that he was against ribs in all castings as being points of weakness.—*A. D. Neal, U. S. Foundries, Inc.*

Tri-State

The second meeting of the season for the Tri-State Chapter was held October 14 at Wilders Restaurant, Joplin, Mo. The subject of this meeting was *"Quality Control in Foundry Operation"* and was discussed by Robert H. Jacoby, St. Louis Coke & Foundry Supply Co. —*Ivan Morrow, Ivan Morrow Pattern Shop & Foundry, Inc.*

Chicago . . At the head table for the October 3 meeting of the chapter are, left to right, H. Overman, Walter Jaeschke, and Bill McFatridge.

Saginaw Valley . . Dr. Mead W. Killion, Rohrer, Hibler, & Replogle, right, speaker at the October 6 meeting is shown with A. T. Peters, Dow Chemical Co., technical session chairman.

Northeastern Ohio . . Norman Stickney, Sand Products Corp., left, and Walter H. Seibert, Cleveland Standard Pattern Works, at the October meeting.

Chicago . . Gene Ballard, Harold Kruger, and D. Jones, left to right, talk shop at the October 3 meeting.

Western Michigan . . Seated at the head table at the October 3 meeting are, left to right: C. H. Cousineau, E. J. Carmody, D. I. Jacobson, William J. Cannon, H. A. LaForet. At the microphone is Dr. Ralph Lee.

Quad-City

The October dinner meeting of the AFS Quad-City Chapter was held at the Hotel Fort Armstrong. Technical chairman, M. H. Horton, Deere & Co., introduced Howard Wilder, Vanadium Corp. of America, who spoke on *"Current Problems in Cupola Melting."*

Mr. Wilder emphasized the value of proper control in cupola operations. This starts with accurate and fast charge make up and its proper distribution in the cupola. Factors effecting carbon control and chill depth were discussed.

When Mr. Wilder closed his talk, he was presented a statue of a molder pouring by the chapter chairman, C. C. Fye, John Deere Harvester Works.—*G. F. Thomas, Deere & Co.*

Chesapeake

The first meeting of the season was held October 28 at the Engineers' Club, Baltimore, Md. Chapter Chairman Joseph O. Danko, Sr., Danko Pattern & Mfg. Co., Inc., presided, and Tom Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., spoke on *"High Pressure Molding."*

On September 23 members of the Chesapeake Chapter were entertained by the personnel of the Newport News Shipbuilding and Drydock Co., Newport News, Va. They visited both the ferrous and non-ferrous foundries of the company, in addition to some of its machine shops. Later they witnessed the docking of the U.S.S. Forrestal, which was just completing its acceptance run for the U. S. Navy.—*H. D. Hammond, Arlington Bronze & Aluminum Corp.*

Birmingham District

Approximately 200 members of the Birmingham Chapter attended the dinner and technical meeting October 21 at the Dinkler-Tutwiler Hotel. Principal speaker was L. L. Ellis, Booz, Allen & Hamilton, who spoke on *"The Management Task in a Competitive Industry."*

Mr. Ellis pointed out that many executives handle too many operating details instead of providing over-all guidance, direction and formulation policies. Although his remarks were directed to top managment in industry, his message also was most appropriate for supervisors at all levels in an organization.—*A. B. Schwarzkopf, U. S. Pipe & Foundry Co.*

Toledo

The October 5 meeting of the Toledo Chapter was held at the Toledo Yacht Club. Wayne W. Camp, Freeman Supply Co., presided, and Cloyce W. Taylor, Alloy Founders, Inc., was technical chairman.

Joseph Schumacher, Hill & Griffith Co., spoke on the *"Carbon Dioxide Process."* After showing the AFS movie on the CO_2 Process, Mr. Schumacher commented on the use he has seen of this new process. He explained that the process could be carried on using a rather wide range of sand grain sizes. The sand must be dry and free from excessive clay. By using seacoal or cellulose for collapsibility, and bonding with from 3 to 5 per cent sodium silicate base binder, the process can be used for a wide range of casting sizes.—*G. W. Davison, National Supply Co.*

Corn Belt

The Corn Belt Chapter held its October 10 meeting in Lincoln, Neb. Vern Holmes, Paxton-Mitchell Co., presided, and John Glennon, Omaha Steel Works, was the technical chairman.

Robert H. Jacoby, St. Louis Coke & Foundry Co., spoke on *"Steel Foundry and Quality Control."* He stressed price, delivery, and quality. A Quality Control Dept. should be placed under the plant head or some member of the executive department. The quality engineer should be one who has a good personality and can be counted on to

get along with men. A college background is a necessity, he said.

The speaker stated that the scrap man should be one of the top men in the plant. Scrap meetings should be held once a week or oftener.—*Eugene Hagedorn, Omaha Steel Works.*

Wisconsin

The October 14 meeting of the Wisconsin Chapter as held at the Hotel Schroeder, Milwaukee. Prof. Richard W. Heine, University of Wisconsin, spoke on *"Molding Methods, Materials, & Casting Dimensions."*

He stated that close dimensional control of green sand castings requires a knowledge of predictable mold wall movement as well as normal shrinkage. High hardness, strength, and relative density allows a minimum of mold wall movement. Effectiveness of jolt ramming depends on weight of sand and length of jolt stroke. The more dense the sand, the more effective the jolt.

Connecticut Non-Ferrous

The Quinnipiack Club, New Haven, Conn., was the site of the October 19 meeting of the Connecticut Non-Ferrous Foundrymen's Association. D. F. Sawtelle, Malleable Iron Fittings Co., gave an interesting speech on *"Sand Review and New Developments."* He cited the advances and improvements in sand technology, sand testing methods and equipment in the past ten years. Foundry studies in schools and colleges, the work of AFS committees on sand research, as well as private laboratories and the government technical sand reports were commended.—*Frank B. Diana, Metallurgist.*

Michiana

The first meeting of the Michiana Chapter for the 1955-56 season was held at the Hotel Whitcomb, St. Joseph, Mich., October 10. Fred Davis, Oliver Corp., presided, and Floyd Crowley, Benton Harbor Malleable Industries Inc., was the technical chairman.

Jeff Alan Westover, Westover Engineers, Milwaukee, spoke on *"Casting Cost Estimating."* He showed slides of different forms that had been successful in various operations. He elaborated on necessity of a definite way of casting cost estimating.—*Robert Hull, Casting Service Corp.*

Canton District

The Canton District Chapter held its first meeting of the current season at the Swiss Club, Canton, Ohio, October 6. The chairman, Harold A. Biddinger, F. E. Myers & Bros. Co., presided.

Carl O. Schopp, Link-Belt Co., Indianapolis, spoke on *"Shell Molding."* He discussed some of the basic procedures for getting started, some of the difficulties encountered, as well as the final results which incorporated automatic molding and assembly equipment.—*R. R. Kozinski, Canton Malleable Iron Co.*

Michiana . . Pictured at the October 10 meetingat Hotel Whitcomb, St. Joseph, left to right: Vern Spears, American Wheelabrator; Floyd Crowley, Benton Harbor Malleable; Jeff Alan Westover, speaker, Westover Engineers; Robert Hull, Casting Service Corp.; and Fred Davis, Oliver Corp.

Southern California . . Bruce Simpson, national president of AFS, shown between William Baud, left, chairman, and Leonard Hofstetter, during a visit to their October 7 meeting.

Canton District . . H. A. Biddinger, chairman; Carl O. Schopp, Link-Belt Co., speaker; F. A. Dun, and W. W. Snodgrass, left to right, at the October meeting of the Ohio chapter.

Central Ohio

The Seneca Hotel, Columbus, Ohio, was the meeting place for the Central Ohio Chapter on October 10. Karl G. Presser, Gray Iron Research Institute, Inc., presided, and N. H. Keyser, Battelle Memorial Institute, was the technical chairman.

J. G. Kura and K. R. Grube, Battelle Memorial Institute, discussed and presented *"A Study of Vertical Gating Design,"* an AFS film.

A plastic model showing the proper arrangement of vertical gating design was displayed.—*Jose Acebo, Ohio Malleable, Dayton Div.*

Ontario

Turnout of 172 members and the introduction of ten new members helped make the first meeting of the season in the Royal York Hotel a great success. P. J. Provias, International Nickel Co. of Canada, Ltd., chairman of the Education Committee and W. Bryce, International Harvester Co. of Canada, Ltd., chapter chairman, presented the cash prizes for the paper writing contest to J. Morgan, Foundry Services, Ltd.; O. R. Scott, International Malleable Co.; and J. H. Baird, Aluminum Company of Canada.

W. Jaeschke, Whiting Corp., presented a paper on *"Practical Considerations of Refractories in Cupola and Air Furnace Practice,"* and L. D. Pridmore, International Molding Machine Co. talked on *"Core and Mold Blowing."*—*C. L. Warden, Canadian General Electric Co., Ltd.*

Oregon

Ray Olson, Shell Process, Inc., Chicopee, Mass., addressed 80 members and guests of the Oregon Chapter at the Heathman Hotel, Portland, September 21. Harry Czyzewski, Metallurgical Engineers, Inc., presided. Fred Menzel, Rich Mfg. Co., was technical chairman.

Mr. Olson spoke on *"Jobbing with Shell Cores and Shell Molds,"* describing the advantages of the shell process over conventional molding methods for many types of castings.

Shell cores have the advantage of faster production, elimination of

Tri-State . . Willis Mook, chairman, left, and R. F. Forsythe, vice-chairman, right, shown with Robert H. Jacoby, St. Louis Coke & Foundry Supply Co., speaker of the evening.

core ovens and costly core driers, and give greater casting precision, eliminating much machining, he said. Core removal is easy. In most cases, the sand will pour out.

Mr. Olson said that his company has poured shell molds which had been stored for one year, with good results. He stated that there was no reason why shell molding sands cannot be reclaimed, as long as resins are destroyed by sufficient heat.—*Bill Walkins.*

Metropolitan

First meeting of the new season was held October 3 at the Essex House, Newark, N. J. Guest speaker was Dorian Shainin, Rath & Strong, Inc., whose subject was *"Quality Control in Foundry Operations."* He discussed the increasing importance of quality control, emphasizing that customer demands are becoming more rigid.

Quality control cannot be inspected into a casting, it must be built in. For that reason, quality control operations must be a vital part of production. Mr. Shainin stressed three kinds of quality: (1) quality of conformance, (2) quality of design, (3) quality of decisions. Also discussed were terms commonly used in quality control operations.

Charles Preusch, Crucible Steel Co., presided and Herman Kretz, Cooper Alloy Corp., acted as technical chairman.—*Herman Kretz.*

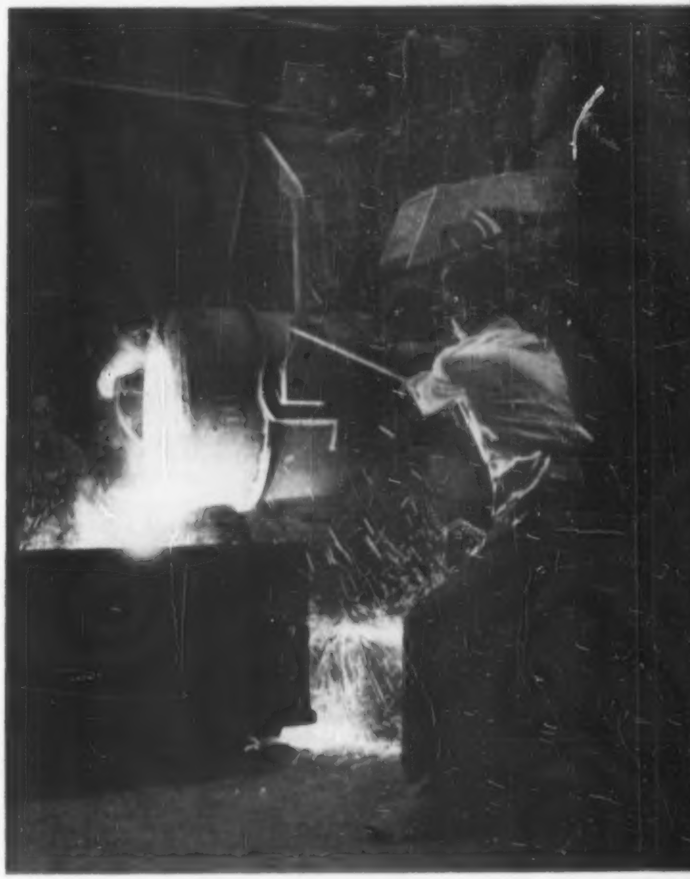
Ontario

The September meeting of the Ontario Chapter was held at the Royal Connaught Hotel, Hamilton, where 150 members heard E. E. Woodliff speak on *"pH Factor of Molding Sand."* He introduced a new factor useful in the pH control of molding material. Although two different molding samples may exhibit the same pH value, each may require a different amount of additive to neutralize it. The factor representing this characteristic of the molding mixture he called "buffer strength."

It is Mr. Woodliff's opinion that this factor of buffer strength is more meaningful than just the pH value in determining the correction

continued on page 91

GE Builds To Advance Metallurgy



Researchers wearing safety gear pour sand mold. Safety glasses saved eyes of man working new one-ton furnace.

■ The world's most complete metals and ceramics processing laboratory is now in operation at the General Electric Research Laboratory, Schenectady, N. Y. With this 72,000 square foot Metals and Ceramics Building and its equipment, representing a $5 million investment, GE will advance its stated aim of developing metallurgy from an industrial art to a pure science.

General Electric's interest in building this laboratory results from its being one of the largest consumers in the metals market. GE is one of the three largest users of copper in the world, with purchases exceeding 50,000 tons last year. Last year's steel consumption was 580,000 tons and aluminum consumption was 11,000 tons.

In the new laboratory GE scientists have facilities for both laboratory research into new materials and processes and for pilot plant operations that will translate the newly gained knowledge into large scale industrial production.

To meet all the requirements for laboratory and pilot plant operations the new building was constructed with an internal structure like an "erector set," permitting quick assembly and alteration as a process is developed. Thousands of bolting holes, aligned throughout the building, from floor to roof, provide the required versatility. Traveling cranes can lift new structural members into place, and move heavy equipment into new locations on short notice. Power supplies and service facilities have been distributed on a modular arrangement to permit this flexibility.

■ The equipment installed for melting and casting is primarily designed for use with super-alloys. During melting super-alloys must be protected from destructive effects of atmosphere, therefore the building is equipped with arc melting furnaces capable of melting the most refractory metals under vacuum and in inert gas atmospheres. In one of the new furnaces, ingots of super-alloys weighing 300 pounds can be turned out at a rate of three a day. Advanced designs now being worked on may enable the furnace to produce a continuous ingot of super-alloy, 4000 pounds or more in weight.

A smaller, 50-pound vacuum arc melting furnace will keep researchers supplied with alloys at an earlier stage of study, and a number of similar laboratory-size furnaces will fill the needs of scientists requiring small quantities of many kinds of alloys for their studies.

An industrial-type, three-phase arc furnace has been installed for the preparation of one-ton heats of steel, with conditions equal to the best attainable in industry.

■ For use in studies of other phases of metallurgy, the new laboratory is equipped with a cold-rolling mill, extrusion press, rod mill, and continuous furnace for heating treating strip.

Research work in the laboratory is under the supervision of Dr. J. Herbert Holloman, manager of the Metals and Ceramics Research Department, GE Research Laboratories. The department has a total staff of over 200, while the new building houses 40 technical and 60 supporting personnel.

afs chapter meetings

DECEMBER

1 . . Canton District . . American Legion, Massillion, Ohio. C. A. Sanders, American Colloid Co., Chicago, "Synthetic Sand vs Natural Bonded Sand."

2 . . Western New York . . Roy Carver, Carver Foundry Products Co., Muscatine, Iowa, *"CO_2 Process."*

2 . . Texas . . Texas A&M College Student Memorial Center, College Station. Foundry Educational Foundation Symposium.

3 . . Central Michigan . . Hart Hotel, Battle Creek. Annual Christmas Dinner Dance.

5 . . Central Indiana . . Athenaeum Turners, Indianapolis. *"Melting Practice in Our Foundry,"* Dallas Lansford, Perfect Circle Corp.; Fred Carl, General Motors Corp.; Larry Emery, Marion Malleable Iron Works.

5 . . Chicago . . Chicago Bar Association. Round Table Meeting. Gray Iron Div.—*"Characteristics and Applications of Ductile Iron,"* David Matter, Manufacturing Research, International Harvester Co. Malleable & Steel Div.—*"Where to Look for New Business,"* Eric Welander, John Deere Malleable Works, East Moline, Ill. Pattern Div.—*"Advantages of a Wood Milling Machine in your Pattern Shop,"* Robert Wright, Oliver Machinery Co., Grand Rapids, Mich. Maintenance & Non-Ferrous Div.—*"Foundry Heating and Ventilating,"* T. A. Lyon, DuBois Engineering Co., Hammond Ind.

6 . . Rochester . . Hotel Seneca, Rochester. T. F. Kiley, Meehanite Metal Corp., *"Gating & Risering."*

7 . . Washington . . Seattle. Dinner-Dance.

7 . . Toledo . . Toledo Yacht Club, Toledo, Ohio. W. E. Sicha, Aluminum Company of America, *"Aluminum Foundry Practice."*

8 . . Saginaw Valley . . Fischer's Hotel, Frankenmuth, Mich. Saginaw Valley Foundry Night. Talks from Saginaw Malleable, Vassar Electroloy, Baker-Perkins, Bostick Foundry, Saginaw Foundries.

8 . . St. Louis District . . York Hotel, St. Louis. Clifford Wenninger, National Engineering Co., *"Sand Fundamentals."*

8 . . Northeastern Ohio . . Christmas Party.

9 . . Metropolitan . . Essex House Hotel, Newark, N. J. Christmas Party.

9 . . Ontario . . Royal Connaught Hotel, Hamilton, Ontario. Past Chairman's Night. Glenn W. Merrefield, Giffels & Vallet, Inc., *"Pressure Molding."*

9 . . Oregon . . Amato's Supper Club, Portland. Stag Christmas Party.

9 . . Mo-Kan . . President Hotel, Kansas City, Mo. Annual Christmas Dance.

9 . . Quad-City . . Blackhawk Hotel, Davenport, Iowa. Christmas Party.

10 . . Twin City . . Nicollet Hotel, Minneapolis. Annual Christmas Party.

10 . . Corn Belt . . Christmas Party.

10 . . Central Illinois . . Legion Hall, Peoria, Ill. Annual Christmas Party.

10 . . Central New York . . Onondaga Hotel, Syracuse. Christmas Party.

12 . . Michiana . . Club Normandy, Mishawaka, Ind. Ferrous—*"Casting Defects,"* W. A. Hambley, Krause Milling Co., Milwaukee. Non-Ferrous—*"Brass and Bronze Foundry Practice,"* F. L. Riddell, H. Kramer & Co., Chicago.

I dunno—he come with that last shipment of sand.

16 . . Birmingham District . . Cascade Plunge, Birmingham, Ala. Annual Ladies Meeting.

19 . . Mexico City . . Mexico City. L. H. Durdin, Dixie Bronze Co. *"Cast Copper."*

JANUARY

3 . . Chicago . . Chicago Bar Association, Chicago. Management Night. James H. Smith, Central Foundry Div., General Motors Corp., *"Recent Foundry Developments."*

4 . . Toledo . . Toledo Yacht Club, Toledo, Ohio. J. W. Winget, Reda Pump Co., *"Melting Iron in Reverberatory Type Furnace."*

5 . . Saginaw Valley . . Fisher's Hotel, Frankenmuth, Mich. National Officers Night. Hans J. Heine, *"AFS Research Activities."*

6 . . Western New York . . William J. White, Shallway Corp., *"Shell Core Making."*

9 . . Central Indiana . . Athenaeum Turners, Indianapolis. John E. Gotheridge, Foundry Services, Inc., *"CO_2 Process."*

9 . . Michiana . . Club Normandy, Mishawaka, Ind. A. F. Pfeiffer, Allis-Chalmers Mfg. Co., *"Coordinative Function of Pattern Equipment and Castings."*

9 . . Metropolitan . . Essex House Hotel, Newark, N. J. J. M. Crockett, Air Reduction Sales Co., *"Injection Methods for Gray Iron."*

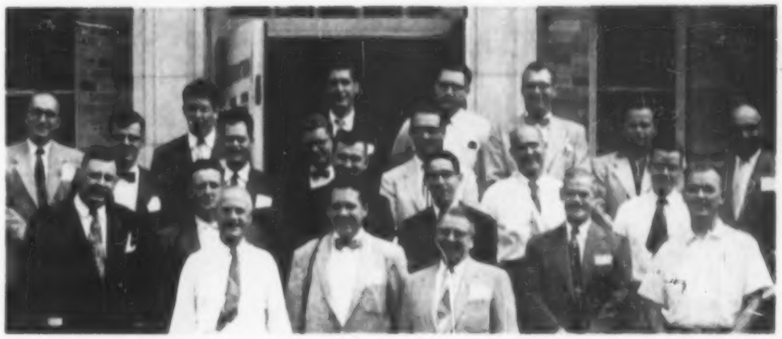
10 . . Rochester . . Hotel Seneca, Rochester, N. Y. Local Talent Night (composed of local chapter members).

10 . . Twin City . . Covered Wagon, Minneapolis, Minn. Leonard Cole, Crane Co., *"How to be Happy."*

12 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. A. A. Evans, International Harvester Co., *"Quality Control in the Foundry."*

13 . . Philadelphia . . Engineers Club, Philadelphia. J. W. Estes and G. E. Spangler, Air Reduction Research Laboratories, *"Ladle Injection by Gas Carrier."*

13 . . Central New York . . Onondaga Hotel, Syracuse. Hans J. Heine, technical director, American Foundrymen's Society, *"AFS Foundry Research Program."*



Missouri Valley . . Alumni of Missouri School of Mines and Metallurgy attending the Missouri Valley Regional Conference in Rolla were, first row, left to right: George E. Mellow, Harry C. Ahl, Jr., Dean Curtis L. Wilson, Richard Wesley Mellow, William E. Walker. Second row: Dr. Daniel Eppelsheimer, James Schaffrodt, Jack H. Thompson, Ralph Johnston, H. J. Pfeifer, Robert Wolf. Third row: David S. Gould, Norman L. Peukert, William Sehnert, C. R. Remington, Clarence Richey, Dr. A. J. Miles. Back row: Dr. T. M. Morris, Albert Vigne, Jack Bodine, William J. Ruprecht, George Mitsch.

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necessary. Buffer strength is determined by placing a weighed amount of material in distilled water. The resultant solution is titrated with a solution of hydrochloric acid or sodium hydroxide of known strength.

The amount of acid or base that is required can be used to determine the amount of additive required. Each additive has a value relative to the standard solution of hydrochloric acid or sodium hydroxide. Molding materials when neutralized show improved flowability as compared to their original acid or basic condition. In most instances green strength is improved. This improvement will result in lower cost of molding.

pH control of core mixtures is an effective way to control cost of core making. W. Bryce, International Harvester Co., presided. Technical chairman was Willard Jones of Canadian Westinghouse.

The chapter's Annual Field Day was held August 27 at W. Rolph Barnes' Hawkhill Farm near Milton. A golf tournament was held in the morning at Credit Valley Golf and Country Club, with afternoon activities at Hawkhill. Horse shoe pitching, swimming, darts, feats of strength and other contests kept attendants busy during the afternoon with a corn husking contest, buffet supper and the awarding of prizes concluding a day of relaxation and entertainment.—*D. Magder and Leonard Humphreys.*

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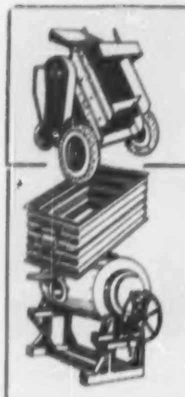
Saginaw Valley . . Woodrow W. Holden, left, retiring chairman, being presented with a plaque in recognition of his service by F. P. Strieter, current chairman of the chapter.

Central Ohio . . J. G. Kura holds casting that he and K. R. Grube, right, gated on principles they developed at Battelle Memorial Institute with water castings and plastic molds.



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HELP WANTED

ENGINEER INDUSTRIAL. Experience in heavy gray iron. Large Conn. foundry. Capable of establishing new basic time standards. Also analyze foundry operations for cost reduction. Indicate experience and salary requirements. **Box C85 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

PLANT ENGINEER with electrical background for malleable iron foundry in New England. Must have had experience in supervising foundry plant maintenance. Full details will be given in personal interview. Write, giving all pertinent information to **Box C86 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

ASSISTANT TO FOUNDRY SUPERINTENDENT in modern foundry located in Western New York state, pouring iron, bronze, aluminum in small to medium castings and having pattern shop for wood and metal patterns. State experience, age and salary desired. **Box C88 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ENGINEER Position with industrial organization developing new and unusual metal forming and treating processes. Necessary to have degree in engineering. Metallurgy preferred. Additional education in foundry sand technology, melting and purifying metals and gating and risering of casting desirable. Minimum of two years experience in foundry industry working with ferrous or non-ferrous cast material production. Ideal Southern California community and enviromental factors. **Box C89 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

DESIGNERS-DRAFTSMEN-ENGINEERS, experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references. **Box C76 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

TIME STUDY OBSERVERS required for Foundry and Heat Treat Plant. Experience in Foundry or similar industry preferred. Please submit resume of experience, education and age to Manager, Employment and Placement Department, **Ford Motor Company of Canada, Limited, Windsor, Ontario.**

FOUNDRY SUPERINTENDENT or WORKS MANAGER 32 years practical experience, ferrous and nonferrous, jobbing and production. Fully qualified to take complete charge all foundry operations. Iron by analysis, high and low carbons, also brass, bronze, aluminum. Have held superintendent positions for past 25 years in Pennsylvania and Alabama. Can also make Green Sand Castings look like Shell Castings, which are made in Shell Molds. Now employed. **Box C87 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

CHIEF METALLURGIST

Chief Metallurgist of Executive calibre by long established large ferrous foundry in Chicago - Milwaukee area. Prefer man of medium age, grounded in ferrous castings with administrative potential. Compatible circumstances and good opportunity. State salary. Will consider confidential. Our employees are aware of this ad. **Box C92 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY ASSISTANT needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S. E. Penna. Reply **Box C65, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

We want several live-wire salesmen who are now working on salary and who think that they could increase their earnings by selling on liberal commission. These men must have followings in industries buying master alloys and hardeners. Please give full details in your first letter, i.e., personal history, employment record, territory, etc. Your information will be held in strictest confidence. **Box C70, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

ENGINEERS. Immediate openings for high caliber men with degrees in mechanical engineering, industrial or management engineering, metallurgy, civil engineering and physics, at salaries ranging from $4345.00 to $8990.00, to perform vital work in connection with the design and development of ordnance materiel. **Mr. R. F. Donohue (Albany or Troy-Extension 2201) Civilian Personnel Officer, Watervliet Arsenal, Watervliet, New York.**

FOUNDRY ENGINEER. Young man with Mechanical Engineering background preferred, for well established modern gray iron foundry located in Chicago area. Must be well versed in foundry practices and capable of making pattern layouts and estimating weights from blueprints. Excellent opportunity with growing, progressive organization. Submit full particulars regarding personal data and experience. **Box C90 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

POSITIONS WANTED

PLANT ENGINEER; BSME, U of Michigan 1952, 2 years experience, Foundry Construction, Installation and Maintenance Equipment. Resume on request. **Box C74, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

REPRESENTATIVES WANTED

SEVERAL EXCLUSIVE TERRITORIES for aggressive organizations now calling on foundries, all types. No supply houses wanted unless you offer capable equipment engineering and service. Nationally advertised, well known line includes shell molding equipment, core blowers, core draw machines, combination blower and draw machines, molding machines, miscellaneous foundry equipment, custom-building and testing equipment. Liberal commissions. **Box C91 MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.**

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10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

BAER STEEL PRODUCTS, INC.
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Investment Casters Appoint

A newly appointed director of the Investment Casting Institute, Chicago, is Peter W. Schipper, general manager of the Investment Casting Div., Howard Foundry, Milwaukee. Schipper was appointed to fill the vacancy on the board of directors left by the resignation of K. J. Yonker.

Chairmen of Institute committees recently appointed are: Membership—K. M. Bartlett, Thompson Products, Inc.; Industry Survey—L. E. Brooks, Jelrus Precision Casting Co.; Public Relations—K. M. Bartlett; Metal Specifications—C. Yaker, Misco Precision Casting Co.; Physical and Non-Destructive Testing—B. W. Duncan, Alloy Precision Casting Co.; Dimensional Tolerances—E. G. Chapman, Misco Precision Casting Co.; and Administrative—Vincent S. Lazzara, Casting Engineers, Inc.

Patterns Win Ford Achievement Award

Low pressure cylinder head patterns won a $100 first place award in patternmaking plus a special outstanding achievement award for James J. Konkel in this year's Ford Motor Co. Industrial Arts Awards competition. Viewing the prize winning entry are (left to right) A. B. Sinnett, assistant secretary, American Foundrymen's Society, James, and his father, John A. Konkel. James completed his patterns while a student at Boys Technical High School, Milwaukee, and has been an apprentice patternmaker at Falk Corp., Milwaukee, since graduating in June. The animated model of an electric furnace (including charging and ladle handling) which won a $100 first place award for William R. Limburg of Brentwood High School, Pittsburgh, Pa., is being studied by Herbert F. Scobie, editor, MODERN CASTINGS. More than 5000 entries were judged in the final competition with awards totalling $50,000.

Terminology Help Wanted

Your hobby, preoccupation, or annoyance with terminology can help an important military engineering project—preparation of an Ordnance Engineering Design Handbook.

As it is no easy matter to establish definitions for many ordnance terms that are used also in other areas, you will be doing a great service by sending formal or informal collections of terminologies, glossaries, specialized dictionaries, or even references to them to: Allen Kent, Associate Director, Center for Documentation and Communication Research, School of Library Science, Western Reserve University, Cleveland 6, Ohio.

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Ontario . . Chapter chairman W. Bryce presents 1st prize in the technical paper contest to J. Morgan, Foundry Services (Canada) Ltd.

Northeastern Ohio

On Sepember 6 Spencer Irwin, associate editor and foreign affairs columnist, *Cleveland Plain Dealer*, discussed *"The State of the World and American Trade."*

O. Jay Myers, Archer-Daniels-Midland Co., a national director of AFS, was a guest at the meeting. Lewis T. Crosby, Sterling Wheelbarrow Co., presided. Alexander D. Barczak, Superior Foundry Inc., introduced Mr. Irwin.

James J. Schalm, Federal Foundry Supply Co., membership chairman, pointed out that Chicago had regained its position over Northeastern Ohio as the world's largest AFS chapter by a count of 735 to 716.—*Kenneth L. Mountain.*

Toledo . . Joseph Schumacher, Hill & Griffith Co., delivering his talk on the "Carbon Dioxide Process," October 5.

obituaries

Lincoln Kilbourne, 44, general manager of sales, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio, died October 5, following a heart attack. He had almost 22 years of service with Jeffrey in a sales capacity.

George Skakel, Sr., chairman of the Board of Directors of Great Lakes Carbon Corp., and his wife, Ann, died October 3 when a company plane in which they were passengers crashed near Union City, Okla.

Mr. Skakel helped form the company after serving as a Naval officer in World War I. Located in Chicago, the company was then Great Lakes Coal & Coke Co. In 1923 the company was incorporated under the laws of the State of Illinois, and at the same time Mr. Skakel became president and a director.

In 1953 Mr. Skakel resigned as president of the corporation and was elected chairman of the Board of Directors.

John F. Steeves, 79, founder of the Corbett-Steeves Pattern Works, Rochester, N. Y., passed away October 22 at his home after working a full day in his shop.

A native of Canada, Mr. Steeves came to Rochester as a boy, and organized the pattern works in 1918. He is a past director of the Rochester Chapter of American Foundrymen's Society, and at the time of his death was on its Auditing Committee.

Patrick Halloran, president of Halloran's Brass Foundry, Inc., Long Island City, N. Y., passed away September 8.

Dr. Joseph Burrough Ennis, 76, former senior vice-president of American Locomotive Co., died in Paterson, N. J., September 22.

Robert S. Haff, Jr., Refractories Sales Engineering Dept., Norton Co., Worcester, Mass., died September 28 at the age of 39. He had been with the company since 1951.

modern castings *and* American Foundryman

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